Comprehensive Study Report

In the Matter of

Westcoast Energy Inc. on behalf of the Grizzly Extension Pipeline and Weejay Lateral

Application dated 31 January 2001

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Acronyms and Abbreviations

AAC	Allowable Annual Cut
AENV	Alberta Environment
AEP	Alberta Environmental Protection
ALF	Alberta Land and Forest
AMP	Access Management Plan
ANHIC	Alberta Natural Heritage Information Centre
ASTM	American Society for Testing and Materials
AWFN	Aseniwuche Winewak First Nation
BCAL	BC Assets and Lands Corporation
BCCDC	British Columbia Conservation Data Centre
Bcf	Billion Cubic Feet
BCMELP	BC Ministry of Environment, Lands and Parks, superceded in 2001 by BCMWLAP and BC Ministry of Sustainable Resource Management.
BCMWLAP	BC Ministry of Water Land and Air Protection
BEC	Biogeoclimatic Ecosystem Classification
BMA	Grizzly Bear Management Area
BWBS	Boreal White and Black Spruce
CAMP	Coordinated Access Management Plan
CEA	Cumulative Effects Assessment
CEAA	Canadian Environmental Assessment Act
CEM	Cumulative Effects Model
CI	Chief Inspector
CMT	Culturally Modified Tree
CNRL	Canadian Natural Resources Limited
CO	Carbon monoxide
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPP	Caribou Protection Plan
CSA	Canadian Standards Association
CSR	Comprehensive Study Report
CWS	Canadian Wildlife Service
DC	Disturbance Coefficient (degree of habitat alienation produced by different disturbances)
DFO	Fisheries and Oceans Canada
E&SCP	Erosion and Sediment Control Plan
EFR	Environmental Field Report
EHS	Environmental Health and Safety
EHSMS	Environmental Health and Safety Management System
EI	Environmental Inspector
EPP	Environmental Protection Plan
ERP	Emergency Response Plan
ESA	Environmentally Sensitive Area
ESCP	Erosion and Sedimentation Control Plan
ESSF	Engelmann Spruce Sub-alpine Fir
FMA	Forest Management Agreement
FSR	Forest Service Road
GBPU	Grizzly Bear Population Unit
GIS	Geographic Information System

HDD	Horizontal Directional Drilling
HFN	Horse Lake First Nation
KLFN	Kelly Lake First Nation
KP	Kilometer Post
KPa	Kilo Pascal (a unit of pressure)
LBC	Line Break Controls
LEH	Limited Entry Hunting
LOC	License of Occupation
LRMP	Land and Resource Management Plan
LSA	Local Study Area
LSD	Legal Site Description
MELP	British Columbia Ministry of Environment, Lands and Parks
MLIB	McLeod Lake Indian Band
MMscf/d	Million Standard Cubic Feet/Day
MoF	BC Ministry of Forests
MOP	Minimum Operating Pressure
MoTH	BC Ministry of Transportation and Highways
NEB	National Energy Board
NES	Northern East Slopes
NO_x	Nitrogen Oxides
OD	Outer Diameter
OGC	BC Oil and Gas Commission
PAHs	Polycydic Aromatic Hydrocarbons
PDR	Petroleum Development Road
PIL	Pipeline Installation Agreement
PLA	Pipeline Agreement
PM	Particulate Matter
PRRD	Peace River Regional District
RFMA	Registered Fur Management Area
RGT	Raw Gas Transmission
RMZ	Resource Management Zone
RoW	Right-of-way
RSA	Regional Study Area
SCADA	Supervisory Control and Data Acquisition
SFN	Salteau First Nation
SO_2	Sulfur dioxide
SRSA	Sub Regional Study Area
TEM	Terrestrial Ecosystem Mapping
TFA	Temporary Field Authorization
TSS	Total Suspended Sediment/Solid
TUAS	Traditional Use and Archeology Study
TUS	Traditional Use Site
UHF	Ultra-high Frequency
USFS	United States Forest Service
VEC	Valued Environmental Component
VHF	Very High Frequency
VOC	Volatile Organic Compound
VOCs	Volatile Organic Components
WMFN	West Moberly First Nation

ZOI	Zone of influence (area of potential disturbance created by a disturbance source (*e.g.*, air emission, noise, visual intrusion, human presence, vegetation and/or soil removal)).

Glossary

Access Development – Construction of new access roads or right-of-way that can be used by vehicles (including recreational vehicles). New access can be permanent (i.e., maintained for vehicle use in perpetuity) or temporary (*e.g.*, used during construction only and subsequently recontoured to the surrounding terrain, revegetated and stream crossing facilities removed).

Access Management – Mechanisms to control or prevent use of access roads or rights of way by vehicles. Mechanisms can include structural barriers (*e.g.*, berms, timber roll back, gates); standing blocks of vegetation (pipeline is installed under the existing vegetation by boring or directional drilling); re-establishment of vegetation barriers (by seeding, planting and/or encouragement of natural vegetation regrowth); signage; and coordinated access planning with others to optimize use of existing access and establishing common access control standards in relation to land management objectives.

Airshed – The area potentially affected by air emissions from a source or sources.

Baseline – a measurement or calculation of the conditions that exist prior to the construction of a project, or activity, for purposes of providing for a comparison to those conditions that exist after the project has been constructed, or activity has been completed.

Bentonitic Shales – absorbent aluminum silicate clay formed from volcanic ash.

Biogeoclimatic classification system – a hierarchical classification system of ecosystems that integrates regional, local and chronological factors and combines climatic, vegetation and site factors (Ministry of Forests 1995).

Biogeoclimatic Site Series – sites within a variant or biogeoclimatic subzone, with similar abiotic features such as soils and moisture regime, capable of producing the same late seral or climax plant communities (a descriptor in the Biogeoclimatic Ecosystem Classification System) (Ministry of Forests 1995).

Biogeoclimatic Subzone – A biogeoclimatic subzone is a grouping of geographically related ecosystems (variants), with the same regional climate, in which climax ecosystems have the same plant associations (a descriptor in the Biogeoclimatic Ecosystem Classification System) (Meidinger and Pojar 1991).

Biogeoclimatic Variant – a geographic area within a subzone that reflects differences in regional climate such as precipitation and temperature. Climatic differences result in differences in vegetation, soil, and ecosystem productivity (a descriptor in the Biogeoclimatic Ecosystem Classification System) (Meidinger and Pojar 1991).

Biogeoclimatic Zone – A biogeoclimatic zone is a geographic area influenced by a homogenous regional climate and characterized by similar soils, vegetation and patterns of energy flow (a descriptor in the Biogeoclimatic Ecosystem Classification System) (Ministry of Forests 1995).

Blue List – British Columbia: Includes any indigenous species or subspecies (taxa) considered to be vulnerable in British Columbia. Blue-listed taxa are at risk, but are not extirpated, endangered or threatened. Alberta: Any species that "May Be At Risk" of extinction or extirpation, and therefore a candidate for detailed risk assessment.

Climax – A climax plant community association is a mature plant community on the time continuum that is self-replacing and relatively stable in terns of species composition. A climax forest community is the final stage of natural forest succession for its environment (Ministry of Forests 1995).

Climax Tree Community – the end of the sequence of ecological communities successively occupying an area; beginning with the initial stage, and ending with the climax which is the stage in ecological development in which a community of plants is stable and capable of perpetuating itself

Colluvium Bedrock – loose deposit of rock debris accumulated through the action of gravity at the base of a cliff or slope

Core Security Habitat Analysis – an analysis that provides an understanding of changing habitat security for wildlife species of special management or conservation concern (e.g., Grizzly Bear). This analysis accounts for environmental effects of human disturbances to habitats, habitat fragmentation and associated loss of habitat considered ineffective as secure, core (minimal size) habitats.

Culturally Modified Tree – trees that have been modified (*e.g.*, carved, bark stripped) by First Nations people for sacred or traditional uses

Cumulative Environmental Effects – the combination of environmental effects of past, present and likely future projects and activities that interact with one another to have a greater combined environmental effect than when considering each project and/or activity in isolation of each other.

Dog-leg – a sharp bend or turn in a pipeline right-of-way to obscure line of sight.

Esker – A long, narrow ridge of coarse gravel deposited by a stream flowing in or under a decaying glacial ice sheet

Field Reconnaissance – An exploration or survey of an area in order to identify its general character and natural features

Frac-out – Occurs when pressurized drilling mud in a drill hole follows a fracture to the surface of the ground. Can result in drilling mud entering surface waters.

Green List – In Alberta, a list that indicates what populations of species are stable, including generally secure habitats for these species.

Ground Truthing – verification of inferred information about a particular feature(s) of an area through actual site visitation ('on-the-ground' visits).

Guillotine Rupture – a rupture (in this case, of a pipeline) that causes a complete severing of the pipeline into two pieces.

Habitat Availability – the measure of an area's usefulness after estimating the combined environmental effects of direct habitat loss from Project activities and the partial loss of habitat as a result of disturbances and displacement caused by noise and human activity/presence.

Issues Scoping – the process of identifying issues related to the environmental effects assessment of a project, using a number of tools including consultation, literature review, and field studies. Issues are "packaged" into Valued Environmental Components to allow for a focused assessment of potential environmental effects.

Jeeping – process for testing integrity of pipeline coating before pipeline is lowered into the ground.

Lateral – a tributary pipeline which carries gas from a gas well to the main gas transmission line

Marketable Gas – gas that has been processed and refined for use by consumers.

Mesic Habitat – a moderately moist habitat

Morainal landscape – a landscape consisting of an accumulation of boulders, stones, or other debris carried and deposited by a glacier

Partial Rupture – a rupture that does not cause a complete severing of the pipeline into two pieces, but causes a break that compromises the integrity of the structure.

Pigging – a process for cleaning pipelines using in-line devices called pigs. Manifolds are installed on either end of sections of pipe and the pigs are propelled through the pipeline. Liquid and solid wastes that have collected in the pipeline during construction are forced to the downstream end where it is collected and disposed of.

Quaternary Deposits – system of rocks, or sedimentary deposits of the second period of the Cenozoic Era, from the end of the Tertiary Period through the present, characterized by the appearance and development of humans and including the Pleistocene and Holocene epochs

Raw Gas – gas, including sour gas, that has not yet been processed or refined into gas that is marketable for use by consumers.

Red List – British Columbia: Includes any indigenous species or subspecies (taxa) considered to be Extirpated, Endangered, or Threatened in British Columbia. Extirpated taxa no longer exist in the wild in British Columbia, but do occur elsewhere. Endangered taxa are facing imminent extirpation or extinction. Threatened taxa are likely to become endangered if limiting factors are not reversed. Red-listed taxa include those that have been, or are being, evaluated for these designations. Alberta: Any species known to "At risk" after formal detailed status assessment and designation as "Endangered" or "Threatened" in Alberta.

Residual Environmental Effects – those environmental effects (positive or adverse) of a project or activity that may persist after all mitigation strategies have been implemented.

Roach – Ridge of till over top of backfilled pipeline trench to allow settlement of fill in the trench over time.

Road Class Density – an analysis of changes in road and trail features, including the presence of survey and seismic lines.

Roll Back – Woody material which has been cleared from the right of way and is rolled back on to the right of way following construction for erosion or access control purposes.

Seral – The term seral is used in the context of seral stage or seral association. Vegetation communities naturally develop in a continuous and relatively predictable way over time from disturbed ground, through herbaceous and shrub communities, to tree saplings and mature forest (in forested ecosystems). A seral stage refers to a plant association found along this time gradient in the development of an ecosystem.

Seral Community – the entire sequence of ecological communities successively occupying an area from the initial stage to the climax

Shoo-fly – an access road used during construction to go around obstacles on the right of way (*e.g.*, around steep sections, to access bridge crossings on streams)

Site series – A site series is the plant association, which is determined by soil moisture and nutrient regimes, within the subzone or variant

Sour gas – Natural gas containing hydrogen sulphide.

Structural Stage – describes the maturity of the vegetation on a site or in a stand based on age, size and spatial organization (a descriptor in the Biogeoclimatic Ecosystem Classification System).

Subzone – A subzone is a division of a zone and is influenced by regional climate. Soil and topographic conditions influence climax vegetation in a subzone and it is classified by precipitation and temperature (i.e. moist, cool or dry, warm).

Upper Cretaceous Formations – system of rocks, and sedimentary deposits of the third and last period of the Mesozoic Era, characterized by the development of flowering plants and ending with the sudden extinction of the dinosaurs and many other forms of life

Valued Environmental Components – key or indicator species, communities, species groups or ecosystems, as well as pathways (e.g. air, water) which act as media for the transfer of environmental effects within the biological and physical environment, therefore making them good indicators of the effects of environmental impacts. VECs can also be used to identify how the social, cultural or economic environment may be affected.

Variant – Variants are divisions of subzones. As a result of geographic variation within a subzone, there are corresponding differences in vegetation, soil and ecosystem productivity. Variants are named by the geographic area they occur in.

Chapter 1

Introduction

On 31 January 2001, Westcoast Energy Inc. (Westcoast) applied for a certificate of public convenience and necessity pursuant to section 52 of the *National Energy Board Act* (the Act) to construct and operate the Grizzly Extension Pipeline and the Weejay Lateral (the Project).

Pursuant to the *Canadian Environmental Assessment Act* (CEAA), the environmental assessment process for the Project commenced on 16 February 2001 with the issuance of letters under section 5 of the *Regulations Respecting the Coordination by Federal Authorities of Environmental Assessment Procedures and Requirements* (Coordination Regulations).

By letter of 9 April 2001, the National Energy Board (the Board) advised Westcoast that, as the Project required more than 75 kilometres of new right of way, a comprehensive study was required under the CEAA. The Board also requested input to assist in determining the scope of environmental assessment from those federal authorities who had expressed an interest in the Project. As responsible authorities for this Project, the Board and the Department of Fisheries and Oceans Canada (DFO), established a process for the preparation of the comprehensive study report (CSR). The process identified Westcoast as being responsible for completing a comprehensive study and preparing the CSR pursuant to section 17 of the CEAA. The participants in the process included Westcoast, DFO, and Board Staff. Environment Canada and the Canadian Environmental Assessment Agency (Agency) also participated by providing specialist advice as federal authorities.

On 20 July 2001, Westcoast submitted a draft CSR to the Board and the above mentioned federal departments and Agency. By letter of 25 September 2001, the responsible and federal authorities provided Westcoast with a review of the draft CSR. In response, Westcoast submitted a revised draft CSR dated 4 January 2002. By letter of 8 February 2002, the Board advised Westcoast that the CSR could not be deemed complete and that the Board was withdrawing from Westcoast the responsibility for the preparation of the CSR. The Board stated that it would proceed to consider the section 52 application for the Project and that the CSR would be prepared by the Board as part of that process, following the completion of the hearing.

On 15 March 2002, the Board issued Hearing Order GH-2-2002 and Directions on Procedure in which it was stated:

> On 8 February 2002 the Board revoked the delegation of the preparation of the comprehensive study (environmental assessment) from Westcoast and advised that the hearing would be used to complete the comprehensive study. Following the hearing, a comprehensive study report will be prepared and will be forwarded to the Canadian Environmental Assessment Agency for review, public comment and a decision by the Minister of Environment.

On 10 May 2002, the Board issued a further letter and an amendment to the Hearing Order to clarify the process for completing the CSR as follows:

> The Board will prepare a CSR based on the evidence adduced during the GH-2-2002 proceeding. The CSR will be provided to DFO to allow it to carry out its responsibilities pursuant to section 10 of the Coordination Regulations. Comments provided by the DFO will be incorporated into the CSR.
>
> When the Board and DFO confirm that the factors determined pursuant to section 8 of the Coordination Regulations have been considered and that the environmental assessment report is complete, the CSR will be sent to the Minister of Environment and the Agency pursuant to section 21 of the CEAA.

This CSR is intended to satisfy the requirements of the CEAA. It incorporates Westcoast's revised draft CSR, the results of public participation and advice from the responsible authorities and other federal departments particularly Environment Canada and the Agency. Deficiencies in Westcoast's draft CSR submission, set out in the 25 September 2001 letter, have been addressed in this CSR.

This document includes Westcoast's revised draft CSR with some minor changes to accommodate the addition of information received through the Board's hearing process, and the conclusions reached. The appendices to Westcoast's revised CSR have not been included but may be obtained by contacting the Board. Following Westcoast's submission in each of Chapters 2, 3, 4, 6 to 11, and 14 to 16, is a discussion of additional information provided by Westcoast and interested parties through the Board's hearing process. This information is entitled "Additional Submissions". Certain information has either changed or been clarified since the submission of Westcoast's revised CSR. It is important that both the information from Westcoast's revised CSR is read together with the information that has been added. An example of this is Westcoast's change from a proposed construction start date of July 2002 to a proposed construction start date of December 2002 with a corresponding in-service date of April 2003.

All of the information adduced during the Board's proceeding has been taken into consideration to arrive at the conclusions and recommendations contained in this CSR.

The application and the supporting reports referenced in the CSR are available as part of the public registry for the Project.

It is concluded that the Project is not likely to cause significant adverse environmental effects provided that the commitments, undertakings, monitoring and programs committed to during the hearing, as well as the recommendations set out in this CSR are implemented.

Chapter 2

Project Description

2.1 Westcoast Submission - Revised Draft CSR - 4 January 2002

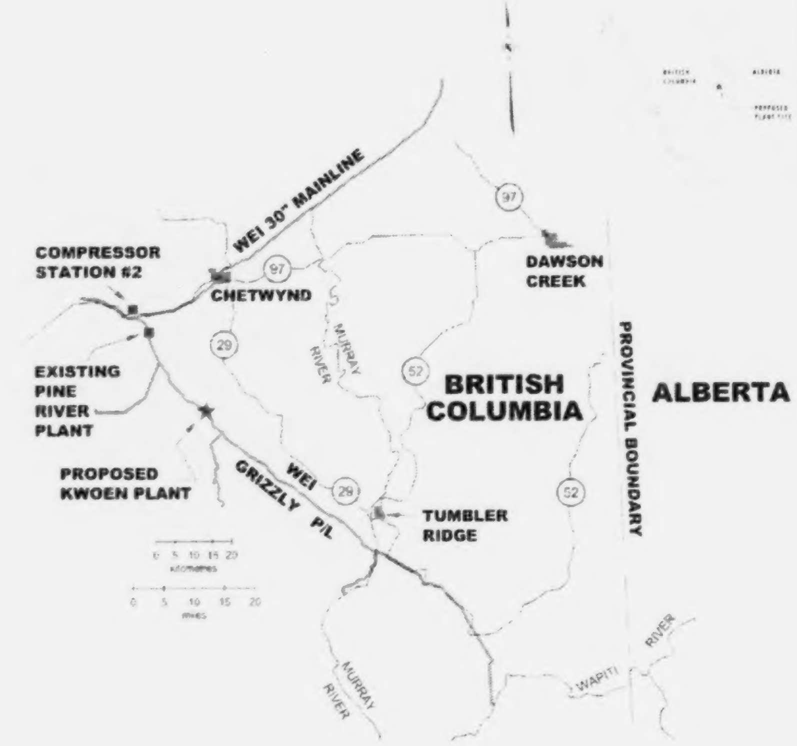
2.1.1 Existing Westcoast Facilities

Westcoast owns and operates a natural gas pipeline system which extends from points in the Yukon Territory, the Northwest Territories, the Province of Alberta and the Province of British Columbia through the Province of British Columbia to a point on the international boundary between Canada and the United States of America near Huntingdon, British Columbia. Westcoast provides shippers on its pipeline system with raw gas transmission, treatment and mainline transmission services in respect of natural gas produced in British Columbia, Alberta, the Yukon Territory and the Northwest Territories.

As an integral part of its pipeline system, Westcoast owns and operates raw gas transmission or gathering pipelines in northeast British Columbia (the Grizzly RGT System) through which raw gas is transported from various producer field locations in the Grizzly Valley resource area (Figure 2-1). This gas, which is sour gas, is transported to Westcoast's Pine River gas processing or treatment plant located 25 km southwest of Chetwynd, British Columbia, where hydrogen sulphide, carbon dioxide and other impurities are removed. The gas treated at the Pine River Plant then flows into Westcoast's Pine River mainline transmission pipeline which transports the gas to Westcoast's Compressor Station No. 2. Thereafter the gas flows through Westcoast's mainline transmission pipelines for ongoing transportation to markets in Alberta and British Columbia and to the international boundary for export to the United States.

The Grizzly RGT System currently extends southeast from the Pine River Plant for a distance of approximately 133 km. The system consists of a main trunk line with loops and a number of lateral pipelines. The gas is gathered by producers from their individual wells through small-diameter pipelines and dehydrated at central field locations before it enters the Grizzly RGT pipelines. Raw gas is currently delivered to the Grizzly RGT System from the Grizzly, Murray, Bullmoose, Sukunka, Highhat, Brazion and Commotion producing areas.

At its extreme southeast end the Grizzly RGT pipeline has a 273.1-mm (10.75-inch) outer diameter (OD). As it progresses northwest towards the Pine River Plant, it increases to 508-mm (20-inch) OD and eventually 610-mm (24-inch) OD as more production is connected through lateral pipelines. A section of the Grizzly RGT pipeline downstream of the Sukunka Lateral is looped such that there are two 610-mm (24-inch) OD pipelines for a distance of 27 km. There are seven lateral pipelines connected to the Grizzly RGT pipeline, including loops, ranging in size from 219.1-mm (8.625-inch) OD to 610-mm (24-inch) OD.


WEI 30" MAINLINE
COMPRESSOR STATION #2
CHETWYND
97
DAWSON CREEK
29
MURRAY RIVER
52
EXISTING PINE RIVER PLANT
BRITISH COLUMBIA
PROVINCIAL BOUNDARY
ALBERTA
PROPOSED KWOEN PLANT
WEI GRIZZLY P/L
TUMBLER RIDGE
0 5 10 15 20 kilometres
0 5 10 15 20 miles
MURRAY RIVER
WAPITI RIVER

WESTCOAST GRIZZLY EXTENSION PIPELINE

Grizzly RGT System

Area of Detail

NORTH
10 5 0 10 20 30 km
Scale in kilometres

Acknowledgements
Prepared by AXYS Environmental Consulting Ltd

AXYS Environmental Consulting Ltd

January 2001
1:1 200,000
LG
SG
EM
CP 611b
2-1
0

The proposed 406.4-mm (16-inch) OD Grizzly Extension Pipeline will extend from a producer receipt point at LSD 5-3-63-11 W6M in Alberta to the terminus of the existing 508-mm (20-inch) OD pipeline at a-74-G/93-I-15 in British Columbia (Figure 2-2 and Map 1). The proposed 273.1-mm (10.75-inch) OD Weejay Lateral will extend from a producer receipt point at d-57-G/93-I-9 in British Columbia to approximately kilometre post (KP) 43 of the proposed Grizzly Extension Pipeline which is located 5.5 km from its crossing of Red Deer Creek.

2.1.2 Purpose and Need for the Project

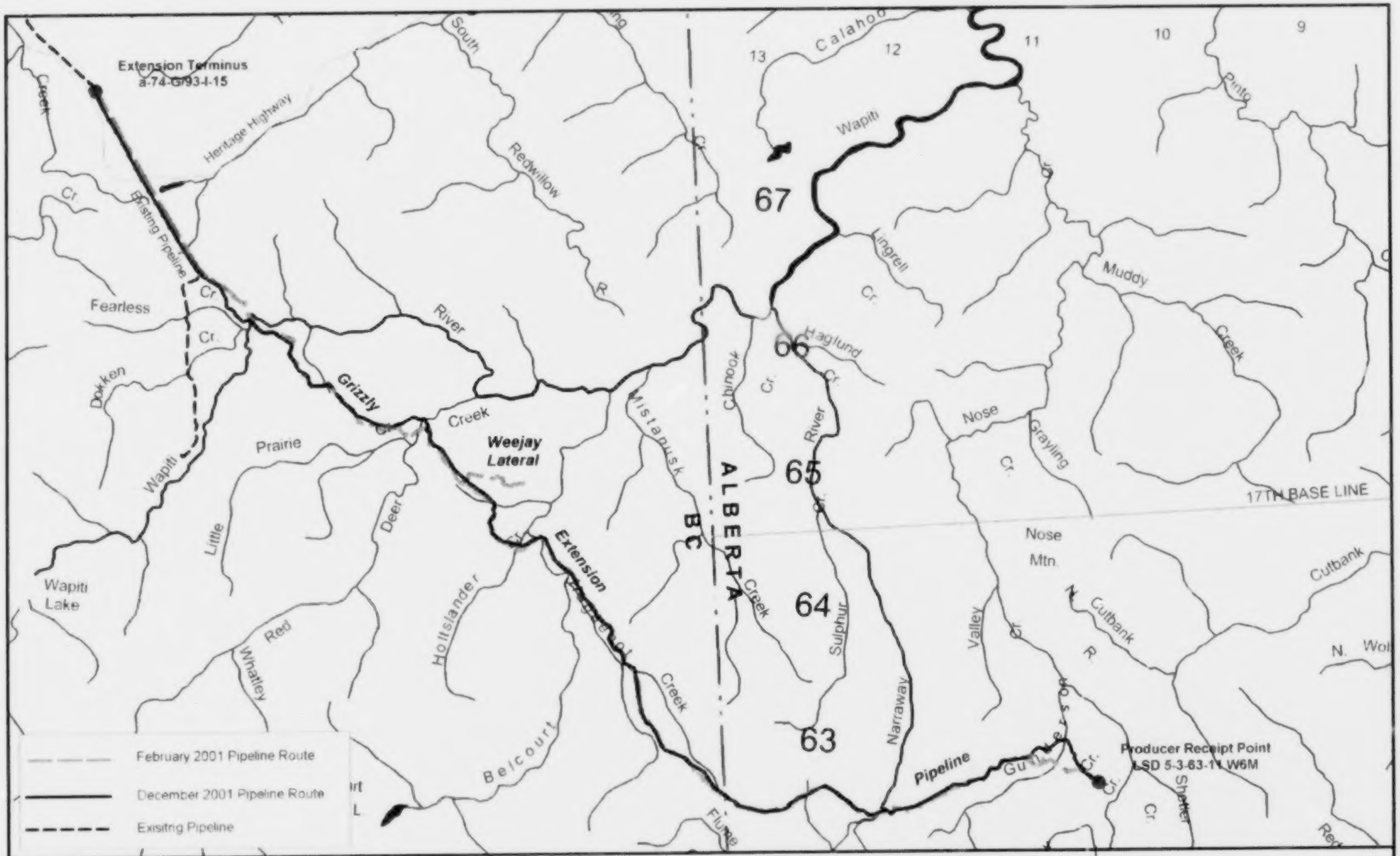
Construction of the Grizzly Extension Pipeline and the Weejay Lateral will enable Westcoast to transport raw sour gas from currently unconnected and future gas reserves, produced by third parties in the Ojay/Weejay and Narraway areas, for delivery on the Grizzly RGT System and treatment at the Pine River Plant.

Wells in the Ojay/Weejay and Narraway areas are currently capped because there are no pipelines to serve the wells. Total proven recoverable unconnected raw gas reserves for the Ojay/Weejay and Narraway areas are estimated to be 7,678 x 10^6 m^3 (271 Bcf) or 5,853 x 10^6 m^3 (207 Bcf) of marketable gas. Estimated undiscovered raw recoverable gas resources within the catchment area of the pipeline totals 108,609 x 10^6 m^3 (3,834 Bcf) or 82,904 x 10^6 m^3 (2,926 Bcf) of marketable gas.

Projected deliverability for the new wells has been determined by a combination of production test results and input from the area producers. Deliverability rates for trend gas wells were assigned based on the initial production or capability averages of producing wells for the last nine years. New wells in the Pardonet-Baldonnel formation (Ojay/Weejay) were assigned initial raw gas deliverabilities of 625 x 10^3 m^3/d (22 MMscf/d). Trend wells in the Taylor Flats (Narraway) were assigned raw gas deliverabilities of 850 x 10^3 m^3/d (30 MMscf/d). The distribution of trend wells was based on the drilling plans and estimates of the distribution of remaining ultimate potential as well as on input from the producers.

Westcoast has entered into service agreements with natural gas producers in the Ojay/Weejay and Narraway areas providing for initial additional deliveries of 3,200 x 10^3 m^3/d (113 MMscf/d) of raw gas (2,365 x 10^3 m^3/d (83.5 MMscf/d) of residue gas equivalent) through the Grizzly RGT System and the Pine River Plant commencing as soon as the proposed pipeline can be constructed following approval by the NEB. The expected in-service date is October 2002 for the western section of the pipeline (KP 0 to Belcourt Creek, KP 52) and March 2003 for the eastern section (KP 52 to KP 108.5).

Approximately 2,690 x 10^3 m^3/d (95 MMscf/d) of raw gas will be delivered through the Grizzly Extension Pipeline and the Weejay Lateral while approximately 510 x 10^3 m^3/d (18 MMscf/d) of raw gas will be delivered through existing Grizzly RGT System laterals. The terms of these service contracts will range from 10 to 15 years and include a dedication of future production from specified lands. The Project is expected to operate for at least forty years. Failure to develop the Project will forego access to these natural gas resources.


Extension Terminus
a-74-G/93-I-15
Heritage Highway
Existing Pipeline
Creek
Cr.
Fearless
Cr.
Cr.
Dokken
Wapiti
Wapiti
Lake
Prairie
Little
Grizzly
Cr.
Creek
Weejay
Lateral
Deer
Red
Whatley
Hollslander
Belcourt
Extension
Creek
Flume
South
Redwillow
R.
River
Mistanusk
Cr.
Chinook
Cr.
ALBERTA
BC
Creek
13
Calahoo
12
Wapiti
67
11
10
9
Pinto
Lingrell
Cr.
66
Haglund
Cr.
River
65
Sulphur
64
63
Narraway
Pipeline
Muddy
Creek
Nose
Cr.
Grayling
17TH BASE LINE
Nose
Mtn.
N. Cutbank
R.
Valley
Cr.
Cutbank
N. Wol
Producer Receipt Point
LSD 5-3-63-11 W6M
Shetler
Cr.
Red
February 2001 Pipeline Route
December 2001 Pipeline Route
Exisitng Pipeline
NORTH
2
0
4
8
12
Scale in kilometres
Area of Detail

WESTCOAST GRIZZLY EXTENSION PIPELINE

Proposed Grizzly Extension Pipeline and Weejay Lateral - Proposed Current Routing

Acknowledgments
Basemap provided by Alberta Environment
Prepared by AXYS Environmental Consulting Ltd

AXYS Environmental Consulting Ltd

May 2001		1 400,000	
LG	EM	2-2	5
LG	CP 611b		

2.1.3 Alternatives to the Project

As indicated in Section 2.1.2, Westcoast has entered into service agreements with gas producers in the Project area to transport their sour gas to Westcoast's Pine River gas processing or treatment plant. Westcoast proposes to meet this obligation through the Grizzly Extension Pipeline and Weejay Lateral Project. There are no other feasible means to accomplish the transportation of the sour gas than by pipeline, since liquefying the gas and transporting it by tanker trucks poses greater environmental and safety risks.

2.1.4 Alternative Means of Carrying Out the Project

Subsection 16(2)(b) of *CEAA* requires comprehensive studies to include the consideration of "alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means." The intent of the Project is to transport raw gas for producers in the Ojay/Weejay and Narraway areas for delivery to the Pine River treatment plant. Thus, only those alternatives that could efficiently collect and transport the raw gas from the gas fields to the Pine River plant were considered feasible and therefore consideration of alternative means of carrying out the Project is addressed by selecting the optimum pipeline route.

2.1.4.1 Preliminary Route Selection

Westcoast initiated the evaluation of pipeline route alternatives during the spring of 2000. Westcoast Engineering selected a very preliminary route using 1:250,000-scale mapping to get an idea of the overall length and the number of major crossings. This supported a preliminary cost estimate and evaluation of constructability. The preliminary route selected was a relatively straight line, extending from the junction of Westcoast's existing 508-mm (20-inch) OD and 273.1-mm (10.75-inch) OD Grizzly RGT pipeline at b-74-G/93-I-15 in British Columbia to a producer receipt point at LSD 5-3-63-11 W6M in Alberta. This route also passed very close to the producer well site in the Weejay area (d-57-G/93-I-9) which will be tied in as part of the proposed Project.

Westcoast presented the preliminary route to AXYS Environmental Consulting Ltd. for their comments on the optional use of existing rights-of-way (RoWs) and disturbed areas and to investigate route alternatives that would minimize potential environmental effects, particularly on regional habitat values. The initial environmental overview of the preliminary route by AXYS identified the principal environmental constraints to pipeline construction in the area: namely fish and wildlife habitat and water crossings.

The incised river valleys in this region of the foothills offer both important regional fish habitat as well as habitat for ungulates and grizzly bear. The proposed alignment encounters caribou range. As a result, a guiding objective in route location was to minimize the potential environmental effects on these habitats or avoid them wherever possible.

The selection of acceptable water crossings and the paralleling of existing linear disturbances were primary factors in route selection for this region. Though the route does not encounter nominated or candidate sites for regulatory protection, the preliminary alignment traversed relatively unroaded terrain from the Huguenot Creek road in B.C. through to the Two Lakes Provincial Forest Recreation Area in Alberta and a designated Environmental Significant Area (ESA) along the Narraway River Valley. Because the Project falls within the West Central Caribou (Caribou winter range) in Alberta, Alberta

Environment requested that pipelines minimize direct disturbance by closely paralleling resource roads in the area. In addition, resource agencies from both B.C. and Alberta are encouraging the protection of the remote area extending from Chinook Ridge (south of the Wapiti crossing of the provincial border) southeast to the Two Lakes area owing to high wilderness/wildlife values in this area.

The outcome of this phase was identification of the most direct routes, which followed the gas trend and ran adjacent to existing corridors as much as possible.

2.1.4.2 Detailed Route Evaluation

Following the preliminary route evaluation, a more detailed route definition and evaluation was initiated, incorporating engineering, environmental and economic criteria. Routing criteria generally applied to the pipeline route selection process are described below.

- *Tie-in points.* The location of tie-in points for a pipeline is a major factor influencing route selection. From a cost perspective, the shortest route between the tie-in points is obviously preferred, although this routing is seldom achieved because of other influential factors discussed below.
- *Gas Production Geology.* The optimal route for a pipeline serving a new region will follow the geologic trend for gas production. This limits the aggregate length of gathering and transmission pipeline to be constructed over the life of the Project, minimizes potential adverse environmental effects, and provides the lowest cost alternative.
- *Construction/Operational Difficulties.* Terrain conditions that present construction difficulties (*i.e.*, steep slopes, large river crossings, extensive wetlands) or the potential for long-term remedial work on the pipeline (*i.e.*, unstable slopes, problematic soils, actively eroding river channels) are avoided wherever practical.
- *Access Routes.* Routes are selected to minimize development of new access. The existing road infrastructure is used for construction and operation of the pipeline to the maximum extent possible. Where practical, valve assemblies are located close to existing roads to facilitate ongoing maintenance and operations.
- *Fish and Wildlife.* Pipeline route selection attempts to minimize conflicts with fish and wildlife resources through avoidance of unique or key habitats wherever feasible (*i.e.*, key winter range, wildlife movement corridors, fish spawning areas). Watercourse crossings are optimized and the potential environmental effects on habitat values are minimized.
- *Unique or Environmentally Sensitive Areas.* Areas that are susceptible to long-term disturbance from pipeline activities even after mitigation (*i.e.*, areas of native or rare plants, key wildlife winter habitat) or identified as sites of unique provincial, national or international character are avoided wherever practical.
- *Land Uses.* Routes are selected to avoid unacceptable conflicts with other existing and/or potential land uses (*i.e.*, areas of Aboriginal concern, industrial developments, extractive resources such as gravel reserves, and recreation areas).
- *Historic Resources.* Pipeline route selection attempts to minimize conflicts with archaeological and historic resources.
- *Use of Existing Corridors.* New pipelines are routed along existing utility routes, trails, seismic lines or existing RoWs within the defined route selection corridor, wherever practicable. A route paralleling existing linear disturbances is generally preferred to minimize habitat alteration and to reduce long-term access-related disturbance. Using existing corridors also allows for the

overlapping (*i.e.*, sharing) of easements, which minimizes additional land requirements, damage to existing resources (*i.e.*, timber, gravel), and the incremental removal of wildlife habitat.

- *Public/Regulatory Input.* The routing of the pipeline is influenced by public and regulatory input. This input is sought after preliminary routing alternatives have been identified but well in advance of final route selection. This stakeholder consultation process ensures that issues of concern to those parties are considered in the Project development. As well, this input may override some of the issues noted above depending upon the reasons and issues identified.

Route evaluation and reconnaissance work for the environmental assessment of the Grizzly Extension Pipeline and Weejay Lateral was undertaken using the following information and activities:

- NTS topographic map sheets at scales of 1:250,000, 1:100,000 and 1:50,000;
- stereo aerial photography and photo alignment sheets at scales of 1:20,000;
- helicopter reconnaissance of the corridor and alternative route options;
- ground-truthing and field investigations to confirm aerial map and air photo data; and
- stakeholder input obtained at meetings with First Nations and Metis community representatives, provincial government agencies, regional government resource staff, open houses and town councils.

Based on the general routing criteria, the Project team identified two route alternatives (Option A and Option B) within the identified corridor. Alberta Land and Forest (ALF) initially suggested a third alternative route (ALF Option) 25 km to the north of the applied-for route. The following sections describe (Options A and B) which Westcoast considered and which incorporated input from government officials and other stakeholders. The two options are shown in Figure 2-3 and on Map 2. The ALF route is discussed in Section 2.1.4.2.3 and shown on Figure 2-3 and Map 2.

2.1.4.2.1 Routing Option A

The Option A route begins at the terminus of the existing Grizzly RGT System's 508-mm (20-inch) OD pipeline at producer receipt point approximately 100 km south-southeast of Dawson Creek in British Columbia (a-74-G/93-I-15). The route follows existing roads to the greatest extent feasible, acknowledging construction limitations and pipeline integrity issues. For 17.0 km the route runs parallel to Westcoast's existing 273.1-mm (10.75-inch) Grizzly Extension Pipeline and an existing Canadian Natural Resources Limited (CNRL) pipeline before continuing as new RoW in a southeast direction to an aerial span crossing of the Wapiti River. The route continues southeast from the Wapiti River crossing location parallel and adjacent to existing roads where practicable. From KP 29 to approximately KP 31.5 the route follows the Red Deer Creek Forest Service Road (FSR), before cutting across two bends in the road to reduce route length. At KP 34.5, it runs parallel to an airstrip and then downslope to cross Red Deer Creek as an aerial span. The route then follows the top of a ridge and along an access road above the Red Deer Creek FSR, to avoid the need for steep side-hill cuts, rejoining the Red Deer Creek Forest Service Road at KP 46. The Weejay Lateral, running westward parallel to an unnamed road for 5.0 km, joins the Grizzly Extension Pipeline Option A at approximately KP 43.

From KP 48 to KP 52.5, Option A requires a new RoW, which crosses Holtslander Creek by isolated crossing technique upstream of its canyon portion and avoids a trappers cabin. The route then crosses under Belcourt Creek, using a horizontal directional drill (HDD) and runs adjacent to the Huguenot Road, mostly on the downhill side to alleviate the risk of slope movement on the uphill side.

Approximately 6 km west of the British Columbia/Alberta border, the pipeline turns east and new RoW development is required. The route crosses the Narraway River by aerial crossing and its backchannel by isolated crossing, and then continues to the northeast to the crossing of the Two Lakes Road. It continues in an easterly direction to the terminus of the proposed pipeline at a producer receipt point, approximately 110 km southwest of Grand Prairie (LSD 5-3-63-11, W6M), Alberta. The portion from KP 100 to KP 109.5 parallels the recently completed Anderson/Devon Exploration pipeline through the Gunderson Creek Valley and like the Anderson line, crosses under Gunderson Creek by HDD.

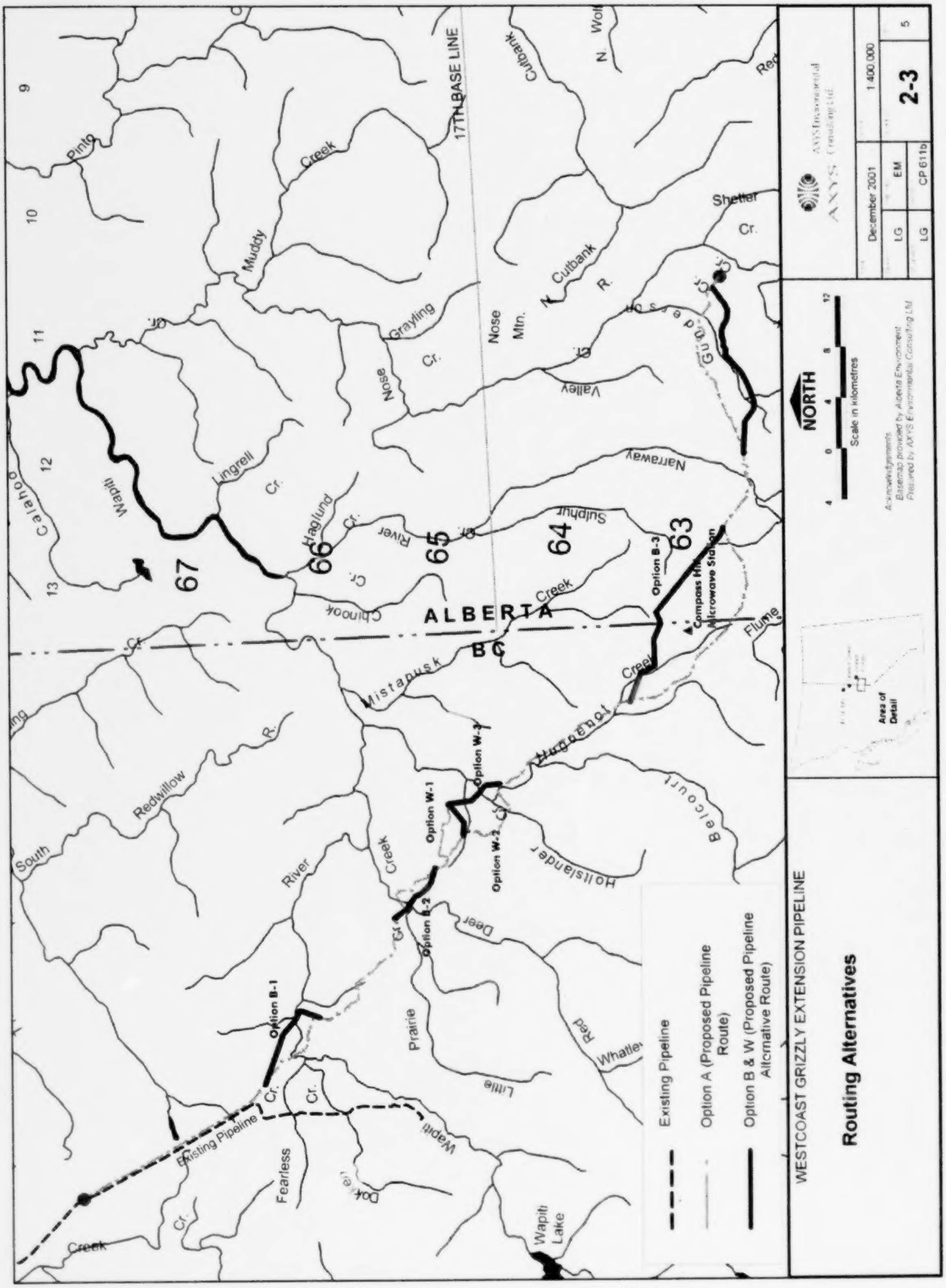
2.1.4.2.2 Routing Option B

Option B follows the same alignment as Option A for 63 km of the 109.5 km RoW alignment. The alternative routing sections consist of (Figure 2-3) (Map 2):

- Section B-1, 6.5 km long, by-passing approximately 5.5 km of Option A between ±KP 18 and ±KP 23.5 crossing the Wapiti River by HDD, approximately 3 km east of Option A;
- Section B-2, 5.0 km long, by-passing approximately 6.5 km of Option A between ±KP 35.5 and ±KP 42 taking a more straight-line route requiring new RoW, crossing Red Deer Creek by HDD and requiring additional stream crossings;
- Section B-3, 16.5 km long, by-passing approximately 19 km of Option A between ±KP 66.0 and ±KP 85.0 as the RoW crosses the British Columbia/Alberta border. This section of Route B takes a more northerly route through relatively undisturbed upland areas on the north side of Huguenot Creek; and
- Section B-4, 14.5 km long, by-passing approximately 15.5 km of Option A between ±KP 92.5 and ±KP 108.0 passing along the south side of Gunderson Creek following existing forest service roads for approximately 60% of the by-pass and crossing the creek by isolated crossing technique.

2.1.4.2.3 Alberta Land and Forest Route

Alberta Land and Forest initially suggested a third alternative route (the ALF Option) 25 km to the north of the applied-for route (Figure 2-3, Map 2). The suggested alternative was to route the pipeline so the Narraway River crossing would be at the site of a recently completed logging bridge. Detailed routing has not been developed for this option but the general routing, which entails a 50 km long diversion from the applied for route, is as follows. This route would divert from Option A at approximately KP 53, turn east and follow an existing petroleum development road for 8 km. The route continues to the ENE for 16 km traversing to the north of Boundary, Trap and Chinook Lakes. It then turns south to cross the Narraway River. Approximately 4 km south of the Narraway River the route joins an existing pipeline RoW which is followed south for 22 km at which point the route rejoins Option A at KP 100. A key rationale for the route was to confine access activity to a single corridor in the northern Narraway basin and avoid less developed caribou range to the south.



Existing Pipeline
Option A (Proposed Pipeline Route)
Option B & W (Proposed Pipeline Alternative Route)
NORTH
Scale in kilometres
4
0
4
8
12
ALBERTA
BC
17TH BASE LINE
Option B-1
Option B-2
Option B-3
Option W-1
Option W-2
Option W-3
Compass Hill Microwave Station
Existing Pipeline
Area of Detail
63
64
65
66
67
9
10
11
12
13
Wapiti
Lingrell Cr.
Haglund Cr.
Calahoo
Pinto
Muddy Creek
Grayling Cr.
Nose Creek
Nose Mtn.
N. Cutbank R.
Cutbank
N. Wolf
Shelter Cr.
Red
Gundees Cr.
Valley Cr.
Narraway
Sulphur River
Chinook Cr.
Creek
Mistanusk Creek
Flume
Huguenot
Belcourt
Hollslander
Deer
Redwillow R.
South
River
Creek
Cr.
Prairie
Red
Whatley
Little
Wapiti
Fearless
Dokken
Cr.
Creek
Wapiti Lake

WESTCOAST GRIZZLY EXTENSION PIPELINE

Routing Alternatives

Acknowledgements
Basemap provided by Alberta Environment
Prepared by AXYS Environmental Consulting Ltd.

AXYS Environmental Consulting Ltd.

December 2001		1:400 000
LG	EM	2-3
LG	CP 611b	5

The Alberta Land and Forest Option would result in a diversion 25 km to the north of routing options A and B. A geotechnical assessment of the river crossing site on this option by AMEC (2001) found that the west side of the crossing area could be subject to landslides that could cause the pipeline to fail. This presented a fundamental technical deficiency for the suggested location for the crossing of the Narraway River.

The geotechnical report for the Narraway River crossing on the Alberta Land and Forest Option was reviewed by an engineer with Alberta Environment who supported the conclusion that the crossing site for the routing options A and B was preferable (see e-mail from Ed Ritcey of Alberta Land and Forest to Doug Thorneycroft of Westcoast (Appendix B)). The Narraway crossing location for routing options A and B is the closest (and possibly only) feasible upstream (southerly) location for the river crossing. There are no feasible crossing locations further downstream (north) in proximity to the Alberta Land and Forest Option.

Map 2 shows the location of potential gas pools in western Alberta that could possibly be tied in to the Grizzly Extension Pipeline in the future. Conceptual laterals from these pools to routing options A and B and to the Alberta Land and Forest Option are also shown. The Alberta Land and Forest Option would take the pipeline outside of the geologic trend for the sour gas that is to be carried by the pipeline, resulting in the need for longer gathering pipeline laterals to connect the production sources to the proposed pipeline. The increased length for the proposed RGT line (3 km) and the additional length for the laterals (potentially 18 km), would add significant costs and in all likelihood result in a larger project footprint and related environmental effects (*e.g.*, loss of habitat and new linear corridors).

2.1.4.2.4 Preferred Grizzly Extension Pipeline Route

Given the philosophy of maximizing the extent of the route along existing RoWs and disturbed areas and the geotechnical constraints along the pipeline corridor, there are few routing options available. Those that do exist are primarily straight-line shortcuts across bends in the existing infrastructure of forestry roads and seismic lines in the area. Engineering analysis of the pipeline corridor resulted in only four feasible routing segment alternatives: B1 through B4. The differences between routing Options A and B are not substantial based on consideration of environmental effects. There were not significant differences in types or sensitivities of habitat affected (upland versus valley, old growth, uncommon site series). Therefore the degree of disturbance (relative use of existing corridors) was considered. Option B is ±4 km shorter than Option A but requires ±2 km more of new RoW. Option A has 2 major watercourse crossings and 12 minor crossings whereas Option B has 3 major crossings and 10 minor watercourse crossings. As the minor crossings are small headwater tributaries, the costs and potential environmental effects associated with a single major crossing are greater than those associated with a larger number of ephemeral headwater creeks. Because the environmental considerations did not clearly recommend one option over another, technical and economic considerations (such as avoiding steep terrain) influenced the final route selection. Table 2-1 compares Routing Options B-1 through B-4 with their Option A counterparts.

Option A has been selected as the preferred route alternative from an environmental perspective owing to its greater extent of shared RoW, thereby minimizing disturbance to vegetation and related wildlife habitat.

Environmental alignment sheets were prepared using aerial photographs taken in July 1998 at a scale of 1:20,000 to provide a visual perspective of the proposed route. The alignment sheets show the proposed pipeline RoW, contours, stream crossing locations and delineation of forest type. They also provide highlights of biophysical conditions and environmental protection measures for the entire route. These sheets were filed with the NEB in January 2001 as part of the Westcoast's Application for Certificate of Public Convenience and Necessity pursuant to section 52 of the *National Energy Board Act*. Further studies and on-ground examination of the proposed route subsequent to the filing of the alignment sheets and the submission of the initial draft CSR have refined the route. These changes are shown on the alignment sheets, included as Appendix C of the Westcoast Revised CSR, 4 January 2002, together with a discussion of the changes. The changes were primarily associated with avoidance of erosion-susceptible terrain and maximizing use of existing RoWs.

Table 2-1
Comparison of Routing Options B-1 through B-4 with their Option A Counterparts

Option	A segment	B segment	Comments
B-1	5.5-km segment follows 450 m of existing disturbed clearing, crossing the Wapiti River as an aerial crossing.	6.5-km segment follows 1,600 m of existing disturbed clearing, a potential HDD crossing of the Wapiti River north of the A-segment crossing in more difficult terrain, geotechnically.	The A segment is preferred based on geotechnical suitability of the aerial crossing of the Wapiti River. HDD on B segment was found to be not feasible.
B-2	6.5-km segment follows 1300 m of existing disturbed clearing, including the Red Deer Creek Forestry Service Road and requiring 2 stream crossings. Crosses Red Deer Creek by aerial span.	5.0-km segment following a straight line routing cutting across a large bend in the Red Deer Creek Forestry Service Road, requiring 3 stream crossings and new disturbance.	The A segment is preferred because of its greater use of existing disturbed clearing and, therefore, less new habitat disturbance and new access. Aerial crossing at Red Deer Creek is preferable to geotechnically difficult HDD crossing on B segment.
B-3	19.0-km segment following the Huguenot Road, for the most part, and a seismic line and crossing Goat Creek	16.5-km segment taking a more-direct route through undisturbed upland areas and avoiding Goat Creek.	The A segment is preferred because of its use of existing disturbed clearing and less new habitat disturbance and new access.
B-4	15.5-km segment follows a logging road and the recently completed Anderson Exploration (Devon) pipeline route through the Gunderson Creek Valley. Directionally drill the Gunderson Creek crossing, as requested by Alberta Environment.	14.5-km segment on the south side of Gunderson Creek, following existing forestry roads for approximately 8.5 km. Proposed isolated crossing of Gunderson Creek.	The A segment is preferred because of its use of existing disturbed clearing for the entire stretch.

2.1.4.2.5 Weejay Lateral Options

Three options were considered for the Weejay Lateral (Figure 2-3) (Map 2). These included:

- Option W-1 running 5.0 km westward along a well access road joining the Grizzly Extension Pipeline at KP 43.0;
- Option W-2 running for 3 km southwest along a seismic line, twice crossing an unnamed tributary to Belcourt Creek, and joining the Grizzly Extension Pipeline at KP ±46.0; and,
- Option W-3 running south-southeast for approximately 5 km, crossing Holtslander and Belcourt creeks, to join the Grizzly Extension Pipeline at KP ±53.0.

Table 2-2 compares the three options on the parameters where they exhibit some variation.

Table 2-2
Comparison of Weejay Lateral Options

Parameter	Option W-1	Option W-2	Option W-3
Length of route	5.0 km	3.0 km	5.0 km
Use of Existing Disturbance	existing well access road	existing seismic line	new RoW
Opening Access	existing access	limited existing access	opens new access
New Water Crossings	none	two, one a directional drill	two

Option W-1 was selected as the preferred route for the Weejay Lateral as it parallels an existing road RoW and does not require any stream crossings.

2.1.5 Project Facilities, Design Standards and Schedule

2.1.5.1 Proposed Facilities

The proposed Project consists of the construction and operation of:

- 109.5 km of 406.4 mm (16-inch) OD natural gas pipeline extending from the existing Grizzly Raw Gas Transmission system at a-74-G/93-I-15 in British Columbia to a proposed producer receipt point at LSD 5-3-63-11-W6M in Alberta (Grizzly Extension Pipeline);
- 5.0 km of 273.1 mm (10.75-inch) OD natural gas pipeline Columbia (Weejay Lateral Pipeline) extending from a receipt point at a producer well site at d-57-G-93-I-9 in British Columbia to a tie-in point on the proposed Grizzly Extension Pipeline at C-53-F/93-I-9 in British;
- associated block valve and line-break control valve assemblies;
- expansion of the communications network in the Grizzly Valley area through the construction of one new microwave radio site at Compass Hill; and
- ancillary undertakings in relation to the physical works identified above including
  - various temporary construction workspace,
  - use and maintenance of existing access roads, and
  - use of existing construction camp and/or potential development of a temporary camp.

2.1.5.2 Standards

The Grizzly Extension and the Weejay Lateral pipeline facilities will be designed, constructed, tested and maintained in accordance with Canadian Standards Association CSA Z662-99, the provisions of the *National Energy Board Act*, the *Onshore Pipeline Regulations – 1999*. All butt welds will be 100% radiographically inspected. The minimum wall thickness for the pipeline facilities will be equal to or greater than that required by the standards for a maximum design pressure of 9,930 kPa, with the completed pipeline pressure tested to a minimum pressure of 12,420 kPa.

2.1.5.2.1 Material Specifications

The pipe to be used on this project will meet or exceed CSA Standard Z245.1-98 or ASTM Specifications. Line pipe will be manufactured to CSA Z245.1-98 and additional supplemental requirements. In order to provide positive control of fracture length during operation and pressure testing, all line pipe will be Category II. All valves, fittings and flanges will be in accordance with CSA Z245.15-01, CSA Z245.11-01 and CSA Z245.12-01, respectively. All valves will be PN100 rating.

2.1.5.2.2 Corrosion Protection

The proposed pipelines will be protected against corrosion by a mill-applied external coating of extruded polyethylene supported by cathodic protection. The joints will be coated with a wrap-around style heat-shrink sleeve. Pipe used for directional drills will be coated with an abrasion coating.

2.1.5.2.3 Line-Break Control

Block valves equipped with automatic line-break detection controls will be installed at the end points of both pipelines and at approximately KP 17.5, 43.0, and 95.0 along the Grizzly Extension Pipeline. These locations were selected based on dividing the pipeline into 20- to 40-km long segments, while considering accessibility. The locations are shown on Map 1; all will use existing access. The line-break detection and valve operating equipment will consist of gas hydraulic valve actuators with a spring-to-close fail-safe design, pressure transmitters and connections to the Supervisory Control and Data Acquisition (SCADA) system equipment. Pressure and valve status will be relayed to Westcoast's existing SCADA system by expanding the communications network in the Grizzly Valley area. All line-break control (LBC) valves are in accessible locations adjacent to existing rights-of-way or access roads.

2.1.5.2.4 Communications

To provide UHF and VHF radio communication coverage along the Grizzly Extension Pipeline route a new microwave radio site is required. Compass Hill was selected as the most appropriate site as it is on a high point of land and within receiving distance of all line-break control (LBC) valve sites and the existing Grizzly Valley communications network (Figure 2-3, Map 1). The Compass Hill site is the only location that can provide the necessary line-of-sight link to the existing radio system and coverage of the pipeline route, LBC valve sites and producer receipt point locations. The new microwave radio site will consist of one or two buildings each covering an area approximately 3 m by 6 m, and a communications tower approximately 30 m tall. The tower will contain a VHF radio repeater for mobile radio coverage and UHF radio repeaters for linking to the LBC valve sites and production receipt points.

The microwave radio site will be constructed by Westcoast, who will also be responsible for its operation and maintenance. Construction will involve clearing and site preparation and the erecting of the tower and buildings. Access to the site for both construction and maintenance will be by helicopter only. Access during operation will occur twice annually for maintenance of the facility.

2.1.5.2.5 Capacity

The size of the proposed pipelines has been selected based on an evaluation of the capacity requirements and the costs to construct and operate the facilities. The 406.4-mm (16-inch) OD pipe size for the Grizzly Extension Pipeline has been selected to provide long-term capacity. The capacity requirements that had to be met were:

- the pipeline must provide sufficient capacity at start-up to deliver the initial volumes to be transported over the Grizzly Extension Pipeline and to enable the Grizzly RGT System to deliver a total of 3,200 x 10^3 m^3/d (113 MMscf/d) of raw gas through to the Pine River Plant; and

- the pipeline must have sufficient capacity to accommodate future deliverability based on the potential in the area.

Further, the capacity constraints must be met without exceeding the existing maximum receipt pressure for the downstream Grizzly RGT pipeline (8,070 kPa) or the contractual receipt pressure (8,620 kPa). A smaller pipeline will not have sufficient capacity and the cost of a larger line will be greater than could be justified by the near term potential for gas deliveries from the area.

2.1.5.3 Construction Schedule

The schedule for the Grizzly Extension Pipeline and the Weejay Lateral construction is shown in Figure 2-4.

Construction of Westcoast Energy's Grizzly Valley Extension Pipeline and Weejay Lateral Project is scheduled to occur in two phases.

- **Phase 1** will involve the construction, final cleanup and restoration of the 406.4 mm Grizzly Extension Pipeline between the Grizzly tie-in (a-74-G/93-I-15; KP 0.0) and Belcourt Creek (b-16-G/93-I-9; KP 52), as well as completion of the 273.1 mm Weejay lateral section of the pipeline (d-57G/93-I-9 to c-53-F/93-I-9; tying in to the 406.4 mm pipeline at approximately KP 43).
- **Phase 2** will include the construction, final cleanup and restoration of the 406.4 mm Grizzly Extension Pipeline between Belcourt Creek (KP 52) and producer well site near Gunderson Creek, Alberta (05-03-63-11 W6M; KP 109.5).

Scheduling of Phase 1 and Phase 2 of the pipeline project will be dependent on the receipt date of applicable development approvals and permits. Leave to construct is expected to be received by mid-2002, with clearing and construction of the Phase I of the pipeline commencing mid-July 2002. The entire pipeline project is scheduled to be cleared and constructed within one year. Clearing and construction of Phase 1 of the pipeline will occur from mid-July to October 2002. Construction of Phase 2 will begin after freeze up and be completed prior to spring breakup. However, if conditions are favourable, construction of Phase 2 on the BC side could commence immediately following completion of Phase 1. Phase 2 will be cleared starting in the fall of 2002, during dry ground or frozen conditions.

2.1.6 Construction and Commissioning

Construction and commissioning encompasses all physical project activities required to bring the Project from the completed planning and permitting stage through to the point when commercial gas transmission in the pipeline is ready to begin. For the purpose of this CSR, construction and commissioning is described below in sections addressing access, pipeline construction, and waste management.

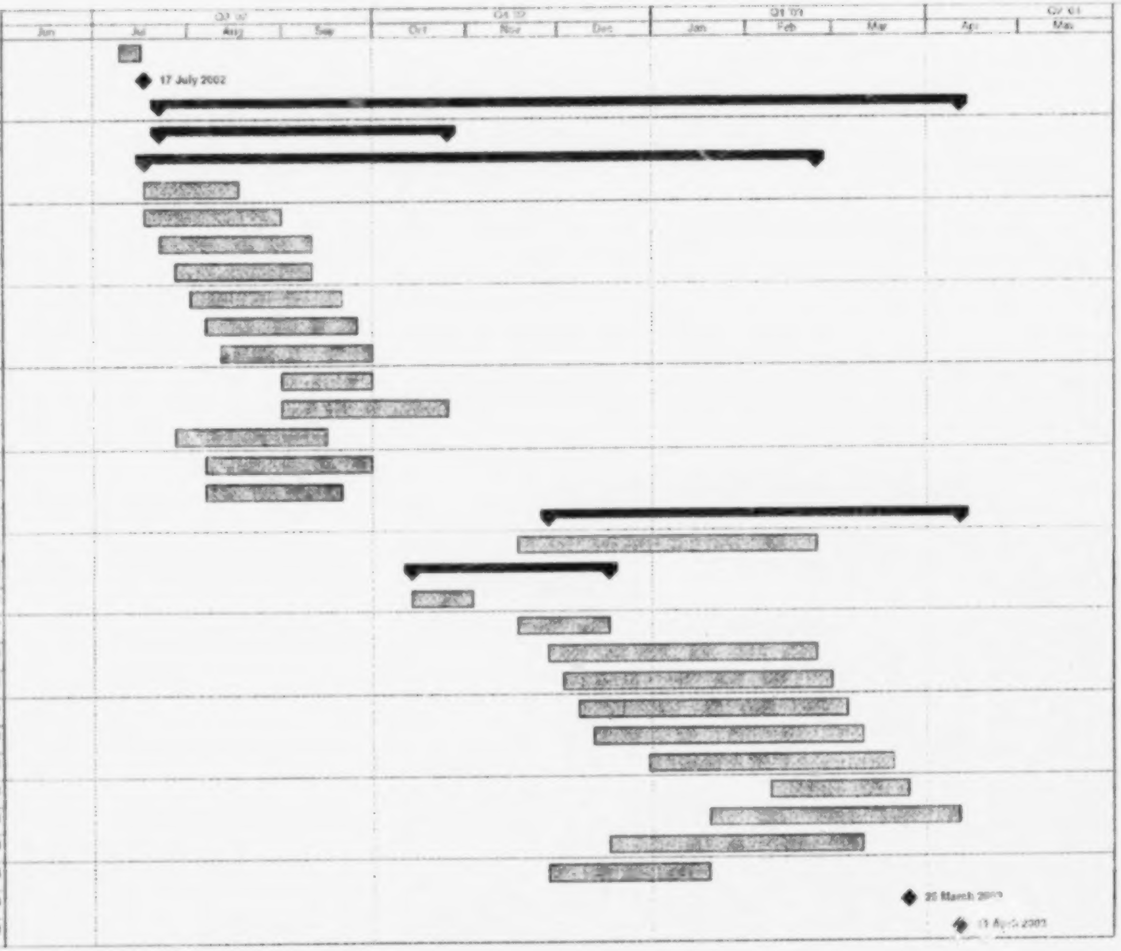
2.1.6.1 Access

For the purpose of the Project Description, access is considered to begin at the point where transportation of equipment, personnel and supplies leaves numbered provincial highways in both British Columbia and Alberta.

Westcoast Energy

Grizzly Extension Pipeline
PROJECT SCHEDULE

ID	Task Name	Start	Finish
1	Approval to Construct	10 Jul '02	16 Jul '02
2	Construction Kick-Off	17 Jul '02	17 Jul '02
3	**Pipeline Construction**	**23 Jul '02**	**11 Apr '03**
4	**Phase I**	**23 Jul '02**	**25 Oct '02**
5	**Clearing**	**18 Jul '02**	**23 Feb '03**
6	Crew A	18 Jul '02	17 Aug '02
7	Crew B	18 Jul '02	31 Aug '02
8	Grading	23 Jul '02	10 Sep '02
9	Stringing	28 Jul '02	10 Sep '02
10	Welding	02 Aug '02	20 Sep '02
11	Ditching	07 Aug '02	25 Sep '02
12	Lower-In & Backfill	12 Aug '02	30 Sep '02
13	Test and Tie-In	01 Sep '02	30 Sep '02
14	Clean-Up	01 Sep '02	25 Oct '02
15	Wapiti River Aerial	28 Jul '02	15 Sep '02
16	Red Deer Creek Aerial	07 Aug '02	30 Sep '02
17	Belcourt HDD	07 Aug '02	20 Sep '02
18	**Phase II**	**28 Nov '02**	**11 Apr '03**
19	Crew C	18 Nov '02	23 Feb '03
20	**Crew D**	**14 Oct '02**	**17 Dec '02**
21	Crew D - non-frozen	14 Oct '02	02 Nov '02
22	Crew D - frozen	18 Nov '02	17 Dec '02
23	Grading	28 Nov '02	23 Feb '03
24	Stringing	03 Dec '02	28 Feb '03
25	Welding	08 Dec '02	05 Mar '03
26	Ditching	13 Dec '02	10 Mar '03
27	Lower-In & Backfill	31 Dec '02	20 Mar '03
28	Test and Tie-In	09 Feb '03	25 Mar '03
29	Clean-Up	20 Jan '03	11 Apr '03
30	Narraway River Aerial	18 Dec '02	10 Mar '03
31	Gunderson Creek HDD	28 Nov '02	19 Jan '03
32	Mechanical Completion	25 Mar '03	25 Mar '03
33	Construction Complete	11 Apr '03	11 Apr '03



Task	▨	Milestone	◆	Rolled Up Split	....	External Tasks	▨	External Milestone	◆
Split	....	Summary	▬	Rolled Up Milestone	◇	Project Summary	▬	External Milestone	◆
Progress	▬	Rolled Up Task	▨	Rolled Up Progress	▬	External Milestone	◆	External Milestone	◆

December 10, 2001

Figure 2-4

The existing road system on both the Alberta and British Columbia sides of the Project are fairly well developed and used every winter for logging. In Alberta, access to the pipeline RoW is provided via the Two Lakes forestry road, off Secondary Highway 666 and Bowen and Lyons Road which are accessed off Two Lakes Road. It is not anticipated that Phase 2 construction activities, during winter, will affect existing roads in Alberta with the possible exception of Lyons Road.

In BC access will be provided via the Wapiti Forest Service Road, off the Heritage Highway. Phase 1 construction on the BC side, during the summer will likely require road maintenance in the form of localized gravel enhancement. In the event of a significant storm or prolonged wet weather, construction traffic could have a more significant effect on road condition and maintenance may include regrading during and following completion of construction.

The majority of the pipeline route is close enough to existing active roads that additional access development will be minimal. Some upgrades (*e.g.*, widening of corners, grading, and/or replacement/extension/installation of culverts) of existing roads/trails may be required in the following areas:

- Lyons Road, off Two Lakes road (KP 92.5 – 101);
- Huguenot Road (KP 52 - 70);
- A logging road on the west side of the Holtslander Creek crossing, which has been reclaimed (this road is not visible on the alignment sheets as the logging was done last year and the base photo for the sheets were shot in 1988);
- "A" road (KP 27 – 37); and
- The PDR system on the north side of the Wapiti River (KP 17 – 19).

Access to the pipeline RoW between interception points with existing access roads, will generally be along the RoW. This will be the case for access between Huguenot Road (KP 70) and Two Lakes Road (KP 95). Temporary shoo fly access will be required where travel on the RoW is not desirable or feasible, for example:

- In steep terrain;
- To gain access to existing bridges for stream crossings (*e.g.*, at the Wapiti crossing); and
- Around standing blocks of timber left by boring under the surface) (*e.g.*, at KP 80).

It is estimated that the total cumulative length of shoo fly access development is unlikely to be more than 3 km. Shoo fly routes will attempt to use existing cleared corridors (old forestry roads, seismic lines) as much as possible. These routes will be reclaimed following construction, as appropriate for access management and habitat protection purposes (Refer also the Access Management Plan, EPP Appendix 3).

An estimate of construction-related traffic (return trips) is presented below.

Phase 1 (KP 0 to Belcourt Creek, KP 52)	**(Mid-July 15 to October 2002)**
Large trucks (mobilize heavy equipment)	2 trips/day over 2 weeks
Large trucks (mobilize camp)	7 trips/day over 3 days
Light trucks/cars (mobilize personnel)	10 trips/day over 2 weeks
Large trucks (pipe)	7 to10 trips/day over 90 days
Light trucks/buses (daily personnel travel)	30 trips/day over 3 months
Light and heavy trucks (fuel, local transport)	25 trips/day over 3 months

Large trucks (demobilize heavy equipment)	2 trips/day over 2 weeks
Large trucks (demobilize camp)	7 trips/day over 3 days
Light trucks/cars (demobilize personnel)	10 trips/day over 2 weeks

Phase 2 (Belcourt Creek (KP 52) to KP 109.5)	**(Fall 2002 to Spring break up 2003)**
Large trucks (mobilize heavy equipment)	7 trip/day over 2 weeks
Large trucks (mobilize camp)	5 trips/day over 3 days
Light trucks/cars (mobilize personnel)	10 trips/day over 2 weeks
Large trucks (pipe)	7 to10 trips/day over 25 days
Light trucks/buses (daily personnel travel)	30 trips/day over 3 months
Light and heavy trucks (fuel, local transport)	25 trips/day over 3 months
Large trucks (demobilize heavy equipment)	2 trips/day over 2 weeks
Large trucks (demobilize camp)	7 trips/day over 3 days
Light trucks/cars (demobilize personnel)	10 trips/day over 2 weeks

Helicopters will probably be used at least once monthly during construction for planning, checking and inspection. During operation, monthly inspection will use helicopter. Some use of helicopter may be required as a contingency for transporting pipe or drill stem in rough terrain. The Compass Hill radio site will be constructed using helicopter access only and operation access will also be by helicopter. Installation of the radio site will take about 10 days of helicopter time over a 2-3 week period. Operations and maintenance would take about 3 visits per year. Flight paths would be by direct line from staging areas and along the RoW.

2.1.6.2 Construction

Pipeline construction is comprised of six major components:

- RoW preparation;
- grading and soil handling;
- stringing, ditching, pipe welding, installation and backfilling;
- hydrostatic testing;
- clean-up and re-vegetation; and
- camp facilities.

These components are described in the following sub-sections.

The potential environmental effects of construction will be mitigated by project specific plans developed in the EPP for the proposed pipeline. The original EPP, Erosion and Sedimentation Control Plan, and Directional Drilling Mud Release Contingency Plan were filed with the NEB Application. These documents have been combined and updated in a revised EPP that has been submitted as a supporting document to this CSR.

2.1.6.2.1 RoW Preparation

RoW preparation will generally follow the sequence outlined below:

- Flag RoW boundaries to be cleared including temporary extra work space areas;
- Establish any required off-RoW access shoo flies;

- Salvage merchantable timber in accordance with line list and approved logging plan and applicable licenses;
- Establish and maintain buffer zones between workspace and water crossings;
- Clear and dispose of woody debris in accordance with specifications and licenses;
- In designated areas retain timber and woody slash debris for use as access control; and
- In conjunction with the RoW preparation, temporary access along the RoW will be established.

2.1.6.2.2 Grading and Soil Handling

Grading will be minimized to the extent practical to accommodate pipe installation and equipment travel. In areas where grading is required:

- The RoW will be stripped of topsoil/duff layer, which will be windrowed to the edge of the RoW or stockpiled in extra work areas; and
- Rock excavation, if required for grade, will be done by ripper equipped crawler tractors and/or hydraulic excavators (if blasting is required it will be supervised by a licensed (ticketed) blaster in accordance with WCB requirements and federal requirements for explosives handling).

2.1.6.2.3 Stringing, Ditching, Pipe Welding, Installation and Backfilling

Each of these activities are generally completed by dedicated crews, except for road crossings, water crossings and difficult areas where a specialized crew will perform all activities. The normal sequence of events is as follows:

- Stringing will commence with pipe haul from stockpile sites;
- Bending will be conducted according to specifications;
- Line up and welding are the next tasks (the individual pipe joints are lined up, clamped in place and bead welding commences followed by hotpass, fill passes and cap weld);
- Ditching will be done by either hydraulic excavators or ditching machines depending on terrain and ground conditions (depth of the ditch will be sufficient to meet the depth-of-cover design requirements specified in the specifications, drawings and line list);
- Welds are visually inspected during the weld process and after completion each weld will be radiographically examined to determine conformity with the specifications;
- After each weld is accepted, it is cleaned and wrapped with a heat shrink sleeve to prevent external corrosion;
- The pipe is then jeeped (scanned with an electronic wand) to check if there are any holidays (uncoated areas) in the pipe coating and sleeves;
- The ditch bottom will be checked for rocks and debris to ensure the pipe and coatings will not be damaged as the pipe is lowered into the ditch;
- After the pipe has been lowered in it will be shaded with select fine-grained material from the ditch excavation to entirely cover the pipe, following which the remaining ditch spoil will be used to backfill the balance to the trench or the pipe is protected by some other means; and
- The various sections of the pipeline are then tied-in by a tie-in crew to form one continuous pipeline.

2.1.6.2.4 Cleaning and Testing

Cleaning and integrity testing of the completed Grizzly Extension Pipeline and Weejay Lateral will be conducted prior to putting the new pipeline sections into service. Pipeline cleaning is carried-out with in-line devices called pigs. Manifolds are installed on either end of sections of pipe and the pigs are propelled through the pipeline. Liquid and solid wastes that have collected in the pipeline during construction are forced to the end where it is collected and disposed of in accordance with all applicable regulations. Regulations regarding the disposal of wastes, including methanol, from cleaning and testing the pipeline are presented in Appendix D of the Westcoast Revised CSR, 4 January 2002.

Following cleaning, the pipeline is pressure tested by hydrostatic or pneumatic methods. During hydrostatic testing, water is pumped into the pipeline pushing a pig through the pipe to remove all of the air. Test pressure is obtained by adding water to the test section with a high pressure pump. At completion of the test, the pressure is released and the water is forced from the pipeline by pushing the pig through the pipe with air. Additional pig runs are made to remove any residual water from the line. The test water will be discharged overland at low velocities in accordance with Section 7 of the Project EPP (hydrostatic testing) (AEP 1998a). After the water is removed, methanol may be added to the pipeline as a drying agent. Methanol solution can also be used if testing occurs under freezing conditions. If so, it is recovered and disposed of in accordance with applicable regulations (Appendix D of the Westcoast Revised CSR, 4 January 2002).

During pneumatic testing, air is pumped into the line and compressed with high pressure compressors. At the completion of the test the compressed air in the pipeline is released to the atmosphere and the pipeline dried as described above.

2.1.6.2.5 Clean-up and Revegetation

Preliminary cleanup will normally proceed testing of the pipeline. During this phase the RoW is restored to a stable condition in order to prevent soil erosion. After satisfactory completion of the testing, final clean-up is carried out and includes de-activation of temporary construction access, replacement of the topsoil/duff layer, cross berms and surface water control. As noted in Sections 2.1.10.3.1 and 9.1.3.1, Westcoast will proactively address the issue of access through close consultation with all parties at interest. At water crossings, revegetation with cuttings and other plantings for habitat and access management functions in accordance with the EPP and Access Management Plan will be completed. The RoW will be reseeded with seed mixtures determined in consultation with and approved by, Alberta Land and Forest and BC Ministry of Forests. Seeding will commence as soon as practical upon completion of clean-up. Additional clean up may be required after the ground thaws in the summer of 2003 thereby necessitating reseeding of disturbed areas following those repairs or subsequently in the fall of 2003. It is possible that repairs in frozen-ground-only areas would have to await for the winter of 2003/2004. Revegetation will be monitored in the summer of 2003 to see where additional clean up and repair and the reapplication of seed is required. Revegetation will be assessed in the spring of 2004. Further information on reclamation monitoring is provided in EPP Section 17.6.

2.1.6.2.6 Camp Facilities

The pipeline construction workforce will most likely be accommodated at an existing construction camps at Tumbler Ridge and at Two Lakes Road near the Project area in Alberta. An independent camp operator has made application for a camp at the Red Deer Creek Airstrip. If this camp is installed, Westcoast will make use of it. If the camp is not installed, Westcoast will install a temporary camp in the same general area. The locations of the Two Lakes and potential Red Deer Creek camps are shown on Map 1. The camps are discussed in more detail in Community Services Infrastructure Section 12.1.4.2.1 under Personnel Accommodation.

2.1.6.2.7 Waste Management

Construction of the pipeline will generate garbage, solid waste and some hazardous waste. Disposal of these wastes will be the responsibility of the pipeline contractor in accordance with local/regional and provincial regulations. Regulations regarding waste management are presented in Appendix D of the Westcoast Revised CSR, 4 January 2002, and in Section 15 of the EPP (Waste Management Plan).

Non-hazardous solid waste generated during construction (spent welding rods, pipe bits, plastic, coating material, *etc.*) will be stored on-site in bins for transport by a commercial waste hauler to the regional landfill site near Chetwynd or the landfill at Grande Prairie and the appropriate tipping fees will be paid. Hazardous wastes (batteries, spent fuel drums, oil and lubricant containers containing residue) will be stored on site in approved containers for pick up and transportation to a provincially approved disposal site by a licensed hazardous waste hauler.

Garbage produced at the construction camp located at Tumbler Ridge will be stored in on-site bins for pick up and delivery to the Tumbler Ridge transfer station by a commercial waste hauler. Garbage generated at the construction camp located in Alberta will be picked up by a commercial hauler and transported to the landfill at Grande Prairie. Additional information on waste management at camps is provided in Section 12.1.4.2.1.

2.1.6.2.8 Emissions and Discharges

Emissions to air associated with construction activities are minor and cannot be quantified with any degree of accuracy. Emissions could potentially originate from vehicle and equipment fuel usage, burning of wood debris, and dust. Project timing, construction conditions, and weather can all be factors in the amount of emissions. These types of emissions would be along the right of way on an intermittent and/or transient basis.

Emissions from fuel usage will originate from vehicles and heavy equipment used throughout the construction phase of the Project. This equipment will be primarily mobile so that these emissions will be distributed along the length of the pipeline. Variables related to fuel usage deal with the time of year, and construction conditions. Winter construction will require more fuel usage than summer construction. The primary fuel being used will be diesel. There is not expected to be any substantive environmental effects related to fuel usage.

Dust conditions will vary significantly depending on weather, soil conditions and the time of year. It is unlikely, even in very dry conditions, that dust will cause a substantive environmental effect, however Westcoast will commit to using water for dust control along the right of way if dry dusty conditions persist (EPP Section 2(9)).

In spite of plans to log all marketable timber and use timber and woody debris for rollback, there will be a need to burn some woody debris. Open burning is provincially regulated, and Westcoast will comply with all applicable regulations when burning. Westcoast will also investigate the option of using equipment to shred some of the woody debris.

2.1.7 Operation and Maintenance

Westcoast will operate and maintain the pipeline in accordance in a manner that will ensure the integrity of the system. The pipeline and associated facilities are anticipated to have a 40-year or more life. The pipeline RoW will be patrolled on a routine basis by helicopter. The pipeline RoW will be clearly marked with signs and post markings at public roads, watercourse crossings and other areas as required to reduce the possibility of damage or interference resulting from construction activities of other projects. Vehicle access will not be maintained on the RoW. Temporary access may be created for maintenance activities requiring vehicle access.

2.1.7.1 Maintenance

Typical maintenance for the pipeline and RoW may include internal pipeline inspections using pigs, annual surface inspections of the RoW, cathodic protection readings and vegetation control. During the operations phase of the pipeline, the average daily project-related traffic on the roads used to access the pipeline should not exceed one light truck per day.

Mechanical clearing will be used for vegetation control on the RoW. Herbicides, used only in small amounts at meter stations and valve site facilities, will be minimized through correct application procedures stipulated under the appropriate guiding regulations. Regulations regarding the transportation and application of herbicides are identified in Appendix D of the Westcoast Revised CSR, 4 January 2002 (EPP Section 4.3). No herbicides will be applied within a 30-m buffer zone of any watercourse.

2.1.7.2 Waste Management

During the operations phase of the pipeline the only waste generated will be pigging wastes. This consists of waste liquid containing asphaltines and corrosion inhibitors. This waste will be disposed of following Westcoast's special waste handling procedure (EPP Section 15). The pigging wastes will be collected in containment at each pigging barrel. Volumes of pigging wastes are expected to be nominal (<1 litre every week).

Solid waste will only be generated in the event of a leak or rupture of the pipeline resulting in pipe or valve replacement. Quantities of waste would likely be low and would be disposed of in an approved manner following applicable laws and regulations. Pipe would be salvaged and recycled.

2.1.7.3 Emissions and Discharges

Emissions associated with the operation of the pipeline will originate primarily from pigging operations. Westcoast has conservatively estimated these fugitive emissions at 16.0 tonnes CO_{2e}, based on once weekly pigging of both the Grizzly Extension Pipeline and the Weejay Lateral. Of this, 14.7 tonnes is CO_2 from combustion (flared pigging barrel contents) and 1.3 tonnes is CO_{2e} from uncombusted methane (vented barrel contents). The methane to CO_2 factor of 21 was employed for the determination of CO_2 equivalency as a greenhouse gas. Of the 16.0 tonnes of CO_{2e}, 72% is attributable to the Grizzly Extension Pipeline and the remainder (28%) to the Weejay Lateral. If the pigging frequency turns out to be less than once per week these emissions will decrease accordingly. $S0_2$ emissions during operation will occur but they will be intermittent and very minor.

2.1.8 Decommissioning and Abandonment

The Grizzly Extension Pipeline and Weejay Lateral are expected to have a minimum 40-year life span. For decommissioning and abandonment, surface facilities (*i.e.*, valves and metering devices) will be removed. Removal of below-ground pipe would result in environmental effects similar to those experienced during construction. To minimize adverse environmental effects, the pipeline will be left in the ground for decommissioning. The pipeline will be disconnected from the any operating facilities, filled with an inert gas, such as nitrogen, to prevent corrosion and sealed. Cathodic protection will be continuously maintained by Westcoast to keep the outer walls of the pipe from corroding. If abandoned, the pipeline may be removed but stream crossings and grass like terrain will be left in place.

Following decommissioning, Westcoast will continue to monitor the RoW to ensure that land uses conform to uses that are permitted. If pipeline removal becomes necessary, those sections under watercourses, wetlands or other sensitive areas will be left in place if approved by the regulatory authorities at the time.

Wastes generated from decommissioning and abandonment activities are expected to include above ground pipeline components and possibly sections of pipe. All solid wastes will be disposed of in accordance with the regulations in place at that time and may include recycling and/or disposal at regional landfills. Emissions associated with decommissioning will originate from depressurizing the pipeline. Westcoast has conservatively estimated this at 1,699 tonnes CO_{2e}, based on depressuring 2/3 Minimum Operating Pressure (MOP) of both the Grizzly Extension Pipeline and the Weejay Lateral. Of this, 1,498 tonnes is CO_2 from combustion (flared pipeline contents) and 201 tonnes is CO_{2e} from uncombusted methane (vented pipeline contents). The methane to CO_2 factor of 21 was employed. Of the 1,699 tonnes of CO_{2e} 98% are attributable to the Grizzly Extension Pipeline and the remainder (2%) to the Weejay Lateral.

It is expected that the pipeline would be drawn down to a minimum operating pressure (assume 2/3 MOP) and the remainder flared. Some methane would be discharged when the pipeline was purged with inert gas. As such, the release of methane and H_2S would be minimized. The majority of the pipeline contents would be converted into CO_2 and SO_2 with non-substantive environmental effect.

2.1.9 Malfunctions, Accidents and Unplanned Events

2.1.9.1 Hazardous Material Spills

Quick detection and response can minimize the effects of accidental events such as spills during construction. Equipment and materials necessary for containment and clean-up of accidental releases should be on site and readily available. To minimize the likelihood of hydrocarbon spills during construction all equipment will be kept mechanically sound to avoid leaks of oil, diesel, gasoline, and hydraulic fluids. Spill Contingency Planning is addressed in greater detail in the EPP (Section 16.3) and will be included in the Emergency Response Plan.

The Waste Management section of the EPP (Section 15) outlines measures to reduce the potential of an accidental release of contaminating products being generated or utilized during pipeline construction. These measures will apply to all Westcoast employees and contractors transporting materials during the construction of the Project through all sections of the pipeline RoW, all staging areas, construction yards, pipe storage areas, and public or private roadways. All personnel will abide by all federal, provincial and project specific requirements for the storage, handling, transport, disposal and spill reporting of all products and waste materials which are potentially hazardous to the environment. Westcoast's *Employer/Contractor, Environment, Health and Safety Handbook* (Westcoast 2000) contains information specific to some of the safe work practices expected of Westcoast's employees, contractors and subcontractors while working on Westcoast projects.

2.1.9.2 Loss of Containment at Watercourse Crossing

Loss of containment of stream flows during open trench creek crossings has the potential to cause a one-time release of sediment from the construction area to downstream habitats. Aerial crossing and HDD techniques have been stipulated for five significant watercourse crossings; this greatly reduces the chance of a large crossing containment loss. The potential for drilling mud release during HDD is addressed by a contingency plan provided in Section 16.2 of the EPP. For the remaining crossings that are designated for isolated stream crossing techniques, the Fish Protection section (Section 12 of the EPP) and Stream Crossing Report (Appendix 2) of the EPP stipulates requirements for back-up pumps and provides minimum requirements for dam and pump and flume crossings.

2.1.9.3 Pipeline Rupture

The main hazard of concern associated with a sour gas pipeline is the possibility of exposure to H_2S in the event of an uncontrolled release of sour gas. Westcoast commissioned a consequence assessment (Jacques Whitford 2001) to evaluate the hazards of a pipeline leak or rupture.

Hydrogen sulphide is toxic to humans at relatively low concentrations. The main objective of this study was to estimate the hazards due to exposure to H_2S associated with the proposed Westcoast Grizzly Extension Pipeline. This analysis was based on the worst-case assumption that individuals are outdoors at one specific location 24 hours a day, 365 days per year. In addition, the Triple-Shifted Rijnmond probit parameters, which describe a function that may be used to predict the probability of lethality for a sensitive individual who is exposed to a given dosage of H_2S, were applied.

Consequences due to exposure to H_2S as a result of an uncontrolled release of sour gas from a pipeline rupture were assessed for guillotine and partial ruptures using the Alberta Energy and Utilities Board GASCON2 model. Hazards were assessed for the four segments of the Grizzly Extension Pipeline under normal and maximum operating conditions. The expected H_2S composition of the pipeline gas is 13%. Results of the consequence analysis were maximum distances to three-minute average ground-level H_2S concentrations of 20 and 100 ppm and to 1% probability of lethality, which were 64.8, 16.3 and 10.2 km, respectively, under worst case conditions. These distances were all predicted to occur as a result of a guillotine rupture of the longest segment (kP 43 to kP 95). These distances are associated with low wind speed ($1.5\ m\ s^{-1}$) and moderately stable conditions, which occur 9.4% of the time. Predicted distances under other meteorological conditions and different rupture scenarios are less than 64.8, 16.3 and 10.2 km. Eighty-six percent of the time, distances to 20 ppm, 100 ppm and a 1% probability of lethality for the worst case rupture scenario (guillotine rupture of the longest segment) are predicted to be less than 15, 4 and 2.5 km, respectively. Corresponding distances are even less for other rupture scenarios. Caution must be exercised when interpreting results for these worst-case conditions for distances greater than about 10 km due to limitations of the model.

2.1.9.4 Other Accidents, Malfunctions and Unplanned Events

In addition to the above, there are a number of other types of accidents, malfunctions and unplanned events such as forest fires, landslides, vehicle accidents, worker injury, wildlife encounters and public accidents that may occur. Unplanned events such as public access along the pipeline RoW can result in environmental effects. The environmental assessment considers these events in the context of each Valued Environmental Component. The EPP provides contingency plans to address fire, drilling mud release and spill response (Section 16). The Emergency Response Plan (Section 2.1.10.3.5) will complement the EPP and address the range of malfunctions, accidents, and unplanned events that may occur and which can be managed to further mitigate the potential environmental effects of the Project.

2.1.10 Environmental Management

Westcoast is committed to the implementation of all environmental mitigation commitments made with respect to the Grizzly Extension Pipeline and Weejay Lateral Project, as documented in this CSR, and supporting documents throughout the life of the Project. To accomplish this objective, Westcoast will employ various components of its corporate environmental management system as it pertains to construction and operation of the Project.

Westcoast has a fully documented, corporate-wide Environmental Health and Safety Management System (EHSMS) (Westcoast 2001b) based on ISO 14001 and BS 8800 standards. The EHSMS elements consist of:

- Corporate Policies and Principles;
- Risk Assessment;
- Operational Programs (including operational procedures);
- Objectives, Targets and Performance Indicators;
- Structure and Responsibility;
- Training Programs;
- Communication;
- Documentation and Records;
- Operational Audits;
- EHSMS Audits; and
- Management Review.

Westcoast's Environmental, Health and Safety Policy statement is presented in Figure 2-5. Specific mechanisms within the EMS framework, to accomplish policy and project-specific environmental objectives during construction and operation of the Project are outlined below.

Figure 2-5
Westcoast Environmental, Health and Safety Policy Statement

Westcoast Energy Inc., including its subsidiary companies, is committed to protecting the environment and maintaining public and employee health and safety throughout all phases and locations of operations and construction activities both domestically and abroad.

In meeting this commitment, Westcoast is guided by the following key principles:

SUSTAINABLE DEVELOPMENT

Environmental, social and economic considerations will be integrated into the processes of planning, construction and operations to ensure that the environment and human needs are supported both in the present and for future generations.

ENVIRONMENT, HEALTH, AND SAFETY RESPONSIBILITY

Environmental protection, health, and safety are considered to be both corporate and personal responsibilities for Westcoast companies and all their employees.

Further to these principles Westcoast companies will:

Policies and procedures: Develop and maintain corporate policies and procedures that promote health, safety and environmental protection.

Employee Training: Provide training to support employee responsibilities with respect to environment, health and safety.

Communication: Maintain regular communications with employees, government agencies and the public on environment, health, and safety concerns and issues.

Responsibility: Design, construct, operate, and decommission facilities in a safe and environmentally responsible manner and in consultation with affected parties.

Mitigation: Minimize and mitigate adverse effects of operations and construction on the environment and local communities.

Monitoring: Conduct environment, health, and safety monitoring to identify possible adverse effects and ensure regulatory compliance of company activities.

Efficiency: Use energy and resources efficiently and effectively.

Waste Management: Manage wastes in a safe and efficient manner, and reduce, recycle, and re-use materials where feasible

Emergency Response: Prepare for, and respond to, emergencies in a timely and effective manner and remedy any environmental damage resulting from company activities.

Reporting: Provide timely reports to government, employees, and other interested parties on environment, health, and safety performance issues.

Compliance: Comply with, or exceed, applicable environment, health, and safety laws and regulations, as well as appropriate corporate and industry standards, policies, and procedures.

Regulatory Consultation: Consult with government agencies to provide input into environment, health, and safety legislation and policy.

Research: Support scientific investigation and technological innovation to enhance health, safety, and environmental protection within the industries within which the Westcoast group of companies operate.

Approved by the Board of Directors, October 22nd, 1997
Signed by Michael Phelps, April 9th, 1998

2.1.10.1 Construction Phase

2.1.10.1.1 Environmental Standards and Procedures

Westcoast has prepared a revised EPP which describes measures to be implemented during the construction of the proposed project. The EPP adheres to the recommendations and provincial guidelines for Alberta and BC, and is consistent with standards contained in Westcoast's Environmental Protection Manual. The Environmental Protection Manual has recently been updated and will be formally presented to the NEB in early 2002.

The EPP specifies overarching and site-specific environmental protection requirements pertaining to all phases of project construction (RoW preparation, grading and soil handling, stringing, ditching, pipe installation and backfilling, hydrostatic testing, cleanup and revegetation) and specific environmental management issues (wildlife, fisheries, erosion and historical resource protection, waste management, notification of concerned parties). Requirements are detailed in the text and accompanying environmental alignment sheets.

The EPP also defines roles, responsibilities and mechanisms for ensuring on-site compliance with the environmental management requirements of this project. Westcoast will obtain the required federal and provincial permits prior to construction and will revise the EPP as required to address any additional permit approval conditions pertaining to environmental management during construction. Refer to Section 17 of the EPP for further information.

2.1.10.1.2 Structure and Responsibility for Environmental Management

The Engineering and Construction Department of the Pipeline Division of Westcoast is ultimately responsible for project construction. The Environmental Health and Safety Department of Westcoast is ultimately responsible for ensuring conscientious environmental management and compliance during project construction.

Project construction will be carried out by a construction contractor, who will be accountable to Westcoast for environmental performance during construction. The chief inspector (CI) will be responsible for the contractors' compliance with environmental regulations and project environmental requirements.

In order to provide quality control on the environmental aspects of the construction inspection, and to ensure the Project is conducted in accordance with Westcoast's environmental policy and standards and project-specific commitments as documented in the EPP, there will be two full time, qualified environmental inspectors (EIs) onsite. Qualifications and duties of the EIs are detailed in the EPP (Section 17). The EIs will report to the CI and to the Westcoast's EHS Environmental Planner for the Project, and advise on requirements for corrective measures as needed to meet corporate standards and commitments.

Both the CI and EIs will have the responsibility and authority to stop work if necessary to ensure compliance with the EPP and environmental regulations. EIs will make recommendations to the CI with regard to environmentally related work stoppages (e.g., wet-weather shut downs) and will be consulted on changes in project design or construction procedures that may arise in the field. EIs will systematically apply environmental criteria (as detailed in the EPP) to ensure decision making is consistent with Westcoast's environmental policy and project-specific management objectives. If required, Westcoast's EHS Environmental Planner will be available to the EIs for decision-making support and resolution of environmental issues arising onsite.

The EHS Environmental Planner is responsible for day to day liaison between the EI and Westcoast's corporate EHS group. The Planner will ensure the Project construction is proceeding consistently with Westcoast's environmental management commitments and will provide support to the EI as needed in resolving issues and communicating with regulatory agencies. If for any reason an issue can not be resolved between the EI and CI, the Environmental Planner will inform Westcoast's EHS Environmental Projects Manager, who will in turn address the matter with Westcoast's Engineering and Construction Project Manager.

2.1.10.1.3 Training

Westcoast will implement an environmental education program to construction personnel and visitors to ensure that all project personnel are fully versed in the environmental requirements of the Project and their specific roles and responsibilities in meeting these requirements. The program will provide progressive levels of training commensurate with the roles and responsibilities of personnel:

- *Basic level* – Non-supervisory construction personnel and visitors;
- *Intermediate level* – Supervisory construction personnel (Construction Inspectors, Contractor Superintendents, Foremen and Resource Specialists); and
- *Advanced level* – Key decision makers (Project Management, CI, EIs and Field Engineers).

Training content will include orientation to Westcoast's environmental policy, environmental standards and related documentation (including the EPP and environmental alignment sheets), environmental management roles and responsibilities, contingency plans and responsibilities during emergencies, and environmental criteria for onsite decision making (Westcoast 2000; 2001b; 2001c; Westcoast Health and Safety Plan. Further details on content for each level of training is provided in the EPP, Section 17.2.

In addition to this standard training program to be provided in advance of construction work, issue-specific, site-specific and refresher training will be provided by the EIs as necessary throughout the construction phase (refer to EPP Section 17.2 for further details).

2.1.10.1.4 Performance Monitoring and Audits

During construction, the EIs will check and report on compliance of construction activities with all requirements in the EPP and assess the effectiveness of mitigative measures. Inspection reports will be conveyed to the CI and EHS Environmental Planner in a timely manner.

Non-compliance will be reported immediately and steps taken to resolve the issue. All issues of non-compliance are highlighted in the daily environmental inspection reports and will be followed up. A summary of non-compliance issues and the status as to how and whether they were resolved will also be included in the Environmental As-Built Report. Any significant non-compliance will be reported immediately to the NEB and appropriate regulatory agencies.

In addition Westcoast will perform a Construction Environmental Audit (Section 17.4 of the EPP). The audit will be conducted during project construction to check the effectiveness of the construction-phase

EMS in fulfilling corporate environmental policy objectives. A senior auditor from Westcoast's EHS Department will undertake the audit and provide recommendations for any corrective actions. The auditor will report to Westcoast's Project Manager and EHS Environmental Projects Manager. EIs will follow-up on any issues of non-compliance raised during the environmental audit.

Following construction, Westcoast will retain a Resource Specialist to implement a two year post-construction monitoring program focussed mainly on access management, reclamation, revegetation, erosion control and slope stability (EPP Section 17.6.1).

2.1.10.1.5 Communications

All potential Contractors will be informed of project environmental requirements as part of the bidding process. The EPP has been written in construction specifications format to facilitate inclusion in the construction contract bid documents and specifications. Evaluation of bids will include consideration of Contractors' commitment to specified environmental standards and requirements.

During construction, the EIs will check and report on compliance of construction activities with all requirements in the EPP and communicate with the EHS Environmental Planner on a regular basis (Section 2.1.10.1.4).

Following completion of construction, the EIs and EHS Environmental Planner will prepare an Environmental As Built Report for the EHS Environmental Projects Manager (EPP Section 17.6.2). This report will be submitted to the NEB and provided to the EHS Team Leader responsible for project operations. If issues remain unresolved following the implementation of remedial measures during construction, the issue and locations in question will be recorded in the Environmental As Built Report which will form the basis of the operations phase environmental monitoring and management program.

2.1.10.2 Operations Phase

2.1.10.2.1 Environmental Standards and Procedures

All long-term commitments to environmental management of the Project, as specified in the CSR and the EPP and Appendices, will be included in the ongoing monitoring and management requirements specified in the Environmental As Built Report. These will include the following long-term commitments as discussed in the Access Management Plan (EPP Appendix 3) and Section 15 of this report:

- vegetation management on the RoW to achieve habitat protection and access control objectives;
- monitoring of the RoW to check effectiveness of access control measures and take corrective action as necessary; and
- ongoing involvement in coordinated regional access planning with other stakeholders.

The As Built Report will comprise the basic environmental management standards for project operations. In addition, project operations will be guided by Westcoast's EHS policies and procedures pertaining to vegetation management, regulatory compliance, contaminated site management, environmental audit and site decommissioning and by applicable environmental regulations and permit requirements. Where project-specific environmental management commitments for operations differ from existing Westcoast environmental policies and procedures the Project commitments will take precedence.

2.1.10.2.2 Responsibility for Environmental Management

The EHS Team Leader for the Grizzly Valley Gathering Area will be responsible for ensuring operations-phase environmental management standards and objectives are met. The Team Leader will be assisted by local EHS Environmental Specialists in monitoring environmental performance, advising on ways of improving performance, and liaison with regulatory agencies. The EHS Team Leader will advise the Facilities Management Team Leader for the Grizzly Valley Gathering Area, who is responsible for project maintenance and vegetation management on the RoW. EHS staff will also participate, as needed, with the regional Manager of Lands and Resources in coordinated regional access-planning processes for the Project area.

2.1.10.2.3 Performance Monitoring and Audits

The EHS Team Leader will be responsible for ensuring environmental monitoring is conducted as specified in the Environmental As Built Report, for checking the effectiveness of mitigative measures and for taking corrective action as necessary. The EHS Team Leader will report on monitoring results to the Facilities Management Team Leader and EHS Environmental Projects Manager and make recommendations for corrective actions. Monitoring will also be conducted as required by operations environmental permits and results will be reported as required by the regulatory authority.

In addition Westcoast's Environmental Audit Policy (Westcoast 2000) requires that pipeline- and compression-related facilities be audited on a three-year schedule. Corrective actions are recommended as needed based on the audit results and follow up is monitored by the EHS Team Leader and Environmental Projects Manager.

2.1.10.2.4 Training

Westcoast has an on-line modular interactive environmental training program for all operations staff. Subject areas include:

- environmental responsibility;
- environmental impacts of gas facility operations;
- environmental management including environmentally responsible construction;
- procedures for spills and unplanned emissions; and
- responsible waste management.

In addition, specialized training is provided for EHS staff and maintenance staff pertaining to their specific operational responsibilities and areas of expertise.

2.1.10.3 Environmental Management Plans

2.1.10.3.1 Access Management

Access development has been identified as a key issue during the Project scoping process. Access management was discussed in a workshop held on March 1, 2001 to allow stakeholders an opportunity to identify and discuss access management/control measures that will be considered for development of the Project. Further access management planning was conducted in the summer of 2001 to arrive at a detailed approach. The goal of the access management process is to gain an understanding of access management issues and to arrive at a mitigative strategy in consideration of the input from all interested parties. The following is a summary of the issues raised to date.

- Traditional and newly developed access in Crown lands and used by the public of British Columbia should not be unnecessarily restricted unless there are known public safety concerns or the access is in an area of sensitive wildlife habitat.
- Unrestricted public or third-party access along the pipeline RoW has the potential to threaten the integrity of the pipeline facilities.
- The potential access development crossing the BC - Alberta border and extending approximately 10 km on either side of the border poses a resource management concern for regional governments and resident land users.
- New access potentially affects caribou habitat near the BC and Alberta border.
- There is a potential to increase hunting pressures and natural predation resulting from further access development.
- Access management planning must accommodate operations and maintenance of the pipeline and associated right-of-way.
- New access potentially adversely affects guide outfitting opportunities in the Project area.
- Existing access within the Project area limits use by the general public. The limited use on the BC side is due to availability of similar terrain in areas west of the Project. There is higher public use within the Project area from the Alberta side via the Two Lakes Road.
- Access management options should act to effectively deter or impede incompatible uses and/or adverse environmental effects on wildlife along the RoW*e.g.*, line-of-sight, travel along right-of-way.
- The provincial government, through the Dawson Creek Land and Resource Management Plan (LRMP) table, is responsible for initiating, coordinating and implementing regional access management plans, *i.e.*, Coordinated Access Management Plan (CAMP).

Narraway River provides a natural barrier to travel along the RoW. Specific sites were identified as being effective locations for constructing access management measures:

- Immediately east of where the RoW leaves the Huguenot Road;
- Near the Alberta – BC border crossing;
- East of the Narraway River;
- West side of the Two Lakes Road crossing; and

Access management options discussed include the following measures.

- Timber rollback – randomly scattering logs and slash across RoW for an extended length and/or at strategically selected areas where steep terrain would act in concert with the rollback.
- Earthen or slash berms constructed across RoW deterring vehicle traffic and providing for cross-RoW travel for small mammals.
- Trenchless pipe installation in site-specific areas, *e.g.*, water crossings, stretches of forested areas to deter or impede vehicle traffic and reduce line-of-sight.
- Vegetation bulbing. Planting seedlings in strategically selected areas along the RoW o reduce overall width and limit line-of-sight.
- Incorporating a dog-leg in the RoW alignment at road crossings or other appropriate locations acts to limit line-of-sight.

Additional access management planning was undertaken, in consultation with the Alberta Land and Forest, with respect to caribou habitat protection and development of a Caribou Protection Plan. In addition an overall Access Management Plan was developed for the Project, incorporating measures related to caribou protection and other access management issues. This plan is incorporated in the revised EPP (Appendix 3).

2.1.10.3.2 Environmental Protection Plan

An EPP that describes measures to be implemented during the construction of the proposed pipeline project was prepared and filed in the NEB Application for the Project. That EPP was subsequently updated, incorporating further project design information, information from supplementary studies and related mitigation measures. The EPP procedures are designed to mitigate potential environmental effects. Protection measures are written in construction specification format under specific activity headings and include:

- general measures;
- notification of concerned parties;
- RoW preparation;
- grading and soil handling;
- stringing, ditching, pipe installation and backfilling;
- hydrostatic testing;
- cleanup and re-vegetation;
- pipeline operations;
- access management;
- wildlife protection;
- fisheries protection;
- erosion protection;
- historical resource protection;
- waste management;
- contingency plans; and
- environmental compliance.

Appendices include typical drawings, a detailed Stream Crossing Report, an Access Management Plan, Spill Reporting Tables, and Environmental Alignment Sheets.

The EPP includes environmental standards that apply to the Project overall in addition to site-specific protection measures which should be read in conjunction with the Environmental Alignment Sheets.

The EPP measures adhere to the recommendations and provincial guidelines for Alberta and BC and are consistent with Westcoast Pipeline Construction Environmental Protection Manual (Westcoast 1996) and the Canadian Pipeline Water Crossing Committee Watercourse Crossings 2nd Edition (1999). Where applicable, site-specific measures have also been developed for this Project and are discussed in the EPP.

The EPP also details a comprehensive environmental inspection program during construction to ensure that the planned mitigation as outlined in the EPP and other environmental plans and commitments are fully implemented.

2.1.10.3.3 Erosion and Sedimentation Control Plan

An Erosion and Sedimentation Control Plan was developed and filed in the NEB Application. It has subsequently been incorporated in the revised EPP (Section 12) and the appended Stream Crossing Report EPP (Appendix 2). In the EPP (Section 12), general erosion control measures are described to mitigate the risk of potential erosion and suspended solids transport from disturbed areas during the construction and operation of the Grizzly Extension Pipeline and Weejay Lateral. In the Stream Crossing Report the measures are geared toward protection of fisheries resources and address requirements for construction mitigation (stream crossing activities, sediment control, and contingency planning), bank restoration and enhancement (contour grading, armouring, and bank re-vegetation/stabilization techniques) and environmental inspection and awareness (pre-construction activities, environmental inspection and post-construction procedures).

2.1.10.3.4 Directional Drilling Mud Release Contingency Plan

A Directional Drilling Mud Release Contingency Plan was prepared and filed with the NEB as part of Westcoast's Section 52 Application. It has subsequently been incorporated into the revised EPP (Section 16.2). The plan has been developed to ensure appropriate measures are in place to minimize the risk of adverse environmental effects during directional drilling. The plan addresses requirements for general planning measures, emergency response equipment to be maintained on-site during drilling activities, monitoring, primary response and notification requirements and actions to be undertaken in the event of a release and secondary response actions to be taken if a mud release exceeds the containment measures.

2.1.10.3.5 Emergency Response Plan

To minimize the opportunity for, and outline response procedures to, other accidents, malfunctions and unplanned events, Westcoast will require preparation for an Emergency Response Plan (ERP) by the Construction Contractor prior to starting construction (Westcoast 1997). The ERP will address reporting and response procedures for incidents including sour gas releases from a pipeline leak or rupture, forest fires, vehicle accidents, loss of stream containment, worker injury, wildlife encounters and public accidents.

Westcoast's Contractor Construction Management Program – Health and Safety (Westcoast 2001c) describes requirements for developing construction emergency response plans. The contractor is required to prepare an emergency response plan for all potential contingencies of the work, in cooperation with company staff, prior to construction. Contractors are required to ensure that they are adequately prepared to deal with emergencies. Some issues for consideration in planning emergency response are:

- Nature of the work and potential hazards;
- Legislative requirements, first aid regulations, etc.;
- Existing on-site services and facilities for medical assistance, fire protection, etc.;
- Distance to outside ambulance, firefighting services, medical facilities and other emergency response support services;
- Equipment required for contractor supplied services; and
- Qualifications and training of project personnel.

The Westcoast Pipeline Division Construction Project Guidelines for Development of Emergency Response Plans (January 1997) provide additional instructions to Westcoast staff and contractors on authorities and requirements for development of plans (including hazard assessment procedures, response team assignments, training, communications, charts/maps and forms).

2.1.10.3.6 Caribou Protection Plan

As part of the effort to minimize the environmental effects on caribou, and address permitting requirements of Alberta Land and Forest, a Caribou Protection Plan (CPP) was prepared for construction and operation activities on caribou range in BC and Alberta. This plan is in keeping with the Operating Guidelines for Industrial Activity in Caribou Ranges in West Central Alberta and was developed in consultation with provincial authorities. The CPP addresses timing of activities, access development, access management during construction and operations, decommissioning of temporary access, reclamation of the right of way, monitoring and adaptive management and Westcoast's commitment to participating in and catalysing coordination of regional access planning and management.

2.1.10.4 Additional Studies

Westcoast has undertaken several studies to augment its NEB Application and this CSR. Studies which have been completed and submitted to the NEB as supporting documents to the CSR are:

- Songbird Survey for the Proposed Grizzly Extension Pipeline and Weejay Lateral Project (AXYS Environmental Consulting Ltd., November 2001c);
- Westcoast Winter Tracking Survey, Technical Report (AXYS Environmental Consulting Ltd., November 2001b);
- Grizzly Extension Pipeline – Fisheries Assessment of Proposed Stream Crossing Sites – Spring 2001, Addendum Report (RL&L Environmental Services Ltd., October 2001b);
- Consequence Assessment of the Proposed Grizzly Valley Extension Pipeline (Jacques Whitford Environment Limited, submitted November 2001); and
- Rare Plant Technical Report for the Westcoast Grizzly Extension Pipeline (AXYS 2001d).

In addition Westcoast has undertaken traditional use and archaeology studies (TUAS) in consultation with Aboriginal communities with an interest in the Project area (Refer to section 11 for details on the status and findings of the TUAS).

2.2 Additional Submissions

2.2.1 Westcoast

Proposed Facilities

In addition to the facilities referenced in Westcoast's application, Westcoast noted that permanent pigging facilities would be installed at each end of the proposed Grizzly Extension and Weejay Lateral pipelines. Revised line break control valve locations were identified at Kilometre Post (KP) 0.0, KP 17.5, KP 54.0, KP 95.0 and KP 109.5.

The Compass Hill microwave radio communication site (Compass Hill) would include the installation of a small communications shelter and a 400 watt thermo-electric generator, a self-supporting communications tower, kerosene fuel tanks with secondary containment and a timber helipad. Westcoast stated that as the Compass Hill site is an extension of its existing radio system, it does not expect the responsible provincial and federal departments to raise any issues with respect to the construction of the site.

Helicopter flights would facilitate the placement of equipment at Compass Hill and provide transportation during construction.

To support the need for the portion of the project south of KP 52, Westcoast submitted that the Project would connect existing gas reserve areas in Alberta to its existing pipeline system. Westcoast referred to its evidence on the gas trend and Devon Canada Corporation's (Devon) evidence on gas potential for the region to support the Project. Westcoast indicated that a few dry wells in an area does not, by itself, provide an indication of potential productivity of an area.

Camp Facilities

Three camps exist in the vicinity of the Project. No concerns have been identified by Westcoast with respect to the availability of accommodation and it is not proposing to develop or operate any construction camps.

Construction Schedule

Phase 2 construction is to be carried out during frozen ground conditions as required by Alberta Environment. As construction will occur in the July to March time frame, Westcoast submitted that its proposed mitigative measures would address all seasonal considerations.

Alternatives

During the course of the oral portion of the hearing, a proposal by BP Canada Energy Corporation (BP) was discussed by Westcoast and others. As outlined by Westcoast, the proposed BP Facilities include three sections as follows:

- A gathering line would commence at the eastern end of the proposed Weejay Lateral and follow the route of the proposed Westcoast Weejay Lateral until it intersects the proposed Grizzly Extension Pipeline (BP Gathering Line).
- A 406 mm (16 inch) pipeline would follow the Red Deer Forest service road to about KP 32 (BP 406 mm Line).
- At about KP 32, the BP proposal would divert from the Grizzly Extension Pipeline route and run west to well A-ll-1 which is connected by a 219 mm (8 inch) pipeline to Westcoast's existing 273 mm (10 inch) Wapiti Pipeline which connects to Westcoast's existing 273 mm (10 inch) Grizzly Pipeline (BP Downstream Facilities).

The BP Facilities have been applied for and approved under the provincial regulatory authority.

Westcoast submitted that its route selection was designed to follow the sour gas trend throughout this area and would facilitate orderly development of the gas reserves, thus reducing the proliferation of individual producer gas pipeline facilities in the area. Westcoast also stated that it would not duplicate facilities and that it was possible that the BP 406 mm Line, if built, could be used as part of the Project.

With regard to following the route of the BP Downstream Facilities to avoid the area between KP 17 and KP 32, Westcoast submitted that the existing pipelines in the area are all small diameter pipelines and that it would have to build the entire route with a 406 mm (16 inch) pipeline. This route would be substantially longer than its proposed route and would require three major crossings of watercourses at the Wapiti River, Dokken Creek and Fearless Creek.

Westcoast referred to its routing criteria, set out earlier in this chapter, which include avoiding steep terrain and deeply incised watercourses, as the primary reasons for not parallelling sections of the existing roads or the route of the BP 406 mm pipeline. Westcoast also observed that multi-use utility corridors constitute a good approach in certain areas, but that in some areas deviations from the existing corridor can avoid turning the corridor into a barrier to wildlife movement.

2.2.2 Intervenors

Alternatives

During the Hearing, Wapiti River Outfitters (Wapiti) pursued the question of whether part of Westcoast's Project would duplicate the BP Facilities that had been permitted by the British Columbia (B.C.) Oil and Gas Commission. In addition, Wapiti also explored the possibility of connecting the wells in Alberta to other pipeline systems and thereby eliminating the need for constructing the Project beyond KP 55. Regarding the need for the Project in the Huguenot region, Wapiti questioned if the suspended wells in the area demonstrate that there may be no further gas potential in the area between the Belcourt crossing and the Alberta border. It also questioned whether Westcoast was aware of any successful wells in the area.

BP testified that it had applied to the B.C. Oil and Gas Commission and had received a permit for a pipeline proposal (the BP Gathering Line, the BP 406 mm Line and the Downstream Facilities) to tie in certain of its wells to the existing Westcoast Grizzly Valley Pipeline. This was indicated to be an interim measure to address the impact of the delay in connecting the resources in the Ojay/Weejay area and the belief that the BP Facilities could be approved and constructed as soon as processing capacity became available.

BP observed that the size of its BP 406 mm Line was selected so that Westcoast could utilize the pipeline as part of its Project. This would avoid the need to disturb the area twice to construct two separate pipelines.

With respect to the BP 406 mm Line route, BP indicated that, as a result of consultation with stakeholders and discussion with members of the B.C. Oil & Gas Commission, it became apparent that there was a preference for the pipeline route to follow the road. BP submitted that it was seeking the fastest and perhaps easiest way to permit a pipeline and decided to proceed with a route that followed the road.

Finally, BP stated that it would not proceed with construction of the BP Facilities until there has been a resolution of a commercial issue that has arisen between BP and one of the aboriginal stakeholders.

Devon testified that it had reviewed opportunities to tie in its two Alberta wells into the Central Alberta Midstream System or the Talisman Midstream but for its own business reasons decided to support the Westcoast Project.

Both Wapiti and Ms. Biem questioned Westcoast as to why the proposed route, in certain cases, deviated from parallelling existing roads. The issue of using the route proposed for the BP Facilities was also explored. Ms. Biem recommended that Westcoast examine alternative routes and alignments with a view to relocating the Project closer to existing roads.

2.2.3 Department of Fisheries and Oceans Canada

In Section 2.1.6.1 it is suggested that upgrades to access roads may require extension of existing culverts or installation of new culverts. However, DFO in its 16 September 2002 letter[1] observed that Westcoast has not applied for any culverts and that extension or installation of such culverts would likely contravene the habitat protection provisions of the *Fisheries Act*. DFO further observed that, as there are alternatives available with less impact, the Project would not require the installation or extention of culverts in fish bearing streams.

Westcoast has not provided design details for the proposed communication tower. DFO noted in its 16 September 2002 letter[1] that while the communications tower proposed for Compass Hill is only 30 m in height, the Canadian Wildlife Service nonetheless prefers guy wires not be used for this structure. The absence reduces the associated potential for collision-related migratory bird mortalities.

2.3 Conclusions

The Project description as provided by Westcoast, and expanded upon during the hearing, is satisfactory.

Wapiti was the only party to question the need for the Project and only questioned the requirement for the Project to extend past KP 55 for the connection of wells in Alberta. Evidence was provided by Westcoast, BP and Devon to support the need for the Project. The producers in the area would likely undertake separate projects to tie in gas supplies in the absence of the Project pipeline.

Westcoast has sufficiently considered alternatives to the Project and has reasonably concluded that its Project would be the preferred option.

The scope of the environmental assessment for the Project included alternative means of carrying out of the Project, which within the context of the CEAA refers to methods which are technically and economically feasible. Alternative means include those means within the scope and control of the proponent of the project.

The BP 406 mm Line, should it be built, may provide an alternative to part of the applied-for Project. However, the ability to utilize the BP 406 mm Line and, indeed, whether these facilities would be built are not matters within the control of Westcoast. It is accepted that the likelihood of Westcoast and BP duplicating facilities is remote given the evidence that the two parties are prepared to work together.

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[1] Comments provided pursuant to paragraph 16 of Amended Hearing Order and Directions on Procedure AO-02-GH-2-2002

While the deviation of the proposed route from existing roads is a factor to be considered in assessing alternative means, other factors such as following the gas trend to allow for orderly development of the energy resources and minimizing the overall footprint of gas activity are also relevant to that assessment. In this case, the route chosen by Westcoast has been designed to meet the present and future needs of producers. In the long term, the selected route is likely to reduce the proliferation of small-diameter gathering lines and other related facilities.

Westcoast has provided satisfactory information pertaining to the alternative means of routing and designing the Project. Accordingly, the requirement to consider alternative means pursuant to paragraph 16(2)(b) of the CEAA and the scope of the environmental assessment established for the Project, has been satisfied.

Chapter 3

Environmental Setting

3.1 Westcoast Submission - Revised Draft CSR - 4 January 2002

3.1.1 Regional Setting

The proposed Grizzly Extension Pipeline route (109.5 km in length) is located southeast of Tumbler Ridge, in British Columbia and continues into Alberta through the Narraway River area south of Grande Prairie (Figure 3-1). The Weejay Lateral extends 5.0 km from a receipt point at a producer well site in British Columbia to a tie-in point on the proposed Grizzly Extension Pipeline. Along the proposed alignment, the pipeline will pass through the Murray River watershed, the Wapiti River watershed, the Red Deer, Belcourt Creek, Narraway River and Gunderson Creek drainages, all of which are sub-basins of the Peace River watershed.

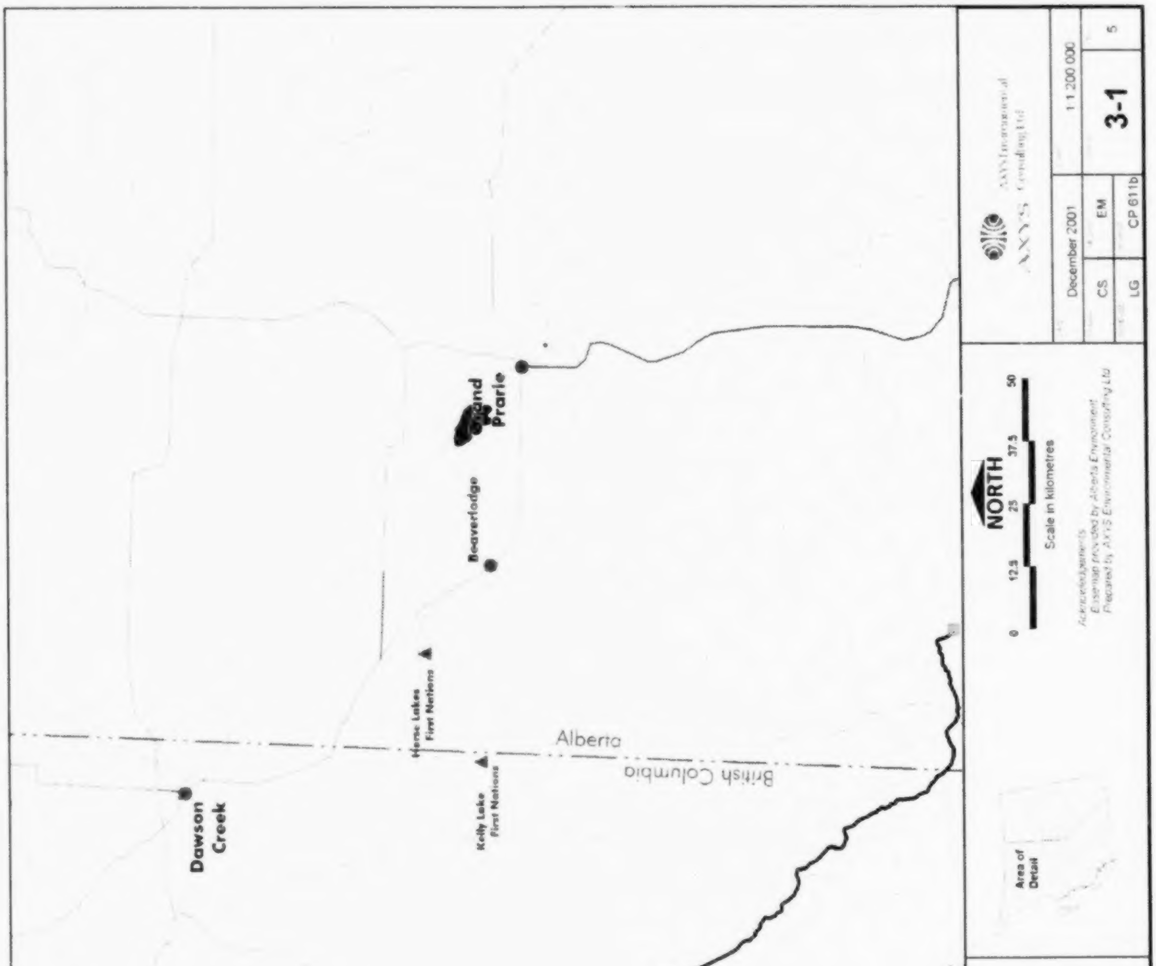
Administratively, the proposed route crosses the Dawson Creek Forest District (of the Prince George Forest Region) within British Columbia, and Forestry Management Unit G3 (P) in Alberta. As well, from a land use planning perspective, the British Columbia portion of the Project is located within the area covered by the Dawson Creek Land and Resource Management Plan (LRMP) (Dawson Creek LRMP 1999). On the Alberta side, there is no equivalent overarching land use plan; however, the Northern East Slopes Strategy has recently been initiated in the area and may serve as a guide to future resource management and land planning in the vicinity of the proposed pipeline in northwestern Alberta.

3.1.2 Geology and Soils

The proposed route runs through the Rocky Mountain Foothills Subdivision of the Northern and central Plateaus and Mountains Physiographic Region of British Columbia (Valentine, *et al.* 1978). This subdivision is characterized by folded sedimentary bedrock that strongly influences the terrain. Modifications by glaciers are minimal resulting in till veneers and blankets overlying sedimentary bedrock. Depth to bedrock is often within 1.5 m.

In Alberta the route runs through two subregions: the Subalpine Subregion of the Rocky Mountain Natural Region; and the Upper Foothills Subregion of the Foothills Natural Region (Achuff 1994). The subalpine region consists of an undulating morainal landscape, with some localized areas of colluvium and residual bedrock. The Upper Foothills are characterized by veneers and blankets of Cordilleran till, overlying Tertiary and Cretaceous bedrock. The terrain of the Upper foothills is typically strongly rolling. The folding and faulting of the bedrock structure strongly influences the landforms and therefore the drainage patterns along the proposed route (Pedocan 1993). Generally, drainage is oriented toward the north and northeast.

The entire length of the proposed pipeline and lateral is underlain by Upper Cretaceous formations, except for a minor segment along Gunderson Creek where bedrock is overlain by extensive Quaternary deposits.


West Moberly First Nations
Saulteau First Nations
Chetwynd
Gwillim Lake Provincial Park
Tumbler Ridge
Monkman Provincial Park
Dawson Creek
Kelly Lake First Nations
Horse Lakes First Nations
Alberta
British Columbia
Beaverlodge
Grand Prarie
Proposed Pipeline Route
Area of Detail
NORTH
0
12.5
25
37.5
50
Scale in kilometres
Acknowledgements
Basemap provided by Alberta Environment
Prepared by AXYS Environmental Consulting Ltd
AXYS Environmental Consulting Ltd
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WESTCOAST GRIZZLY EXTENSION PIPELINE

Environmental Setting

Generally, the bedrock is seldom exposed except at road cuts or along valley walls of watercourses. The sedimentary strata are oriented northwest to southeast, paralleling a majority of the proposed route. There are several formations of sedimentary strata representing a wide range of shales, siltstones, mudstones, sandstones and conglomerates

Hard bedrock is often encountered within 1.5 m of the surface. Therefore the potential for blasting during construction is high. A preliminary geophysical assessment and preliminary grade plan estimated 14.9 km of rock excavation. Some of the bedrock units contain bentonitic shales that are weak and have a low shearing resistance. These units are prone to slides where dips are steep and the topography is more pronounced. The contractor will remove rock in the most expeditious manner possible (*i.e.*, ripping). Only if ripping is not feasible will blasting be employed. There may be requirements for rock removal in Holtslander and Hugeunot Creeks. Environmental protection procedures related to blasting are provided in the EPP, Fisheries Protection Section (12.0), items 25 and 26.

3.1.3 Vegetation

The proposed Grizzly Extension Pipeline is situated on the eastern slopes of the Rocky Mountains. The route crosses two biogeoclimatic zones, the Boreal White and Black Spruce (BWBS) zone and the Engelmann Spruce Subalpine Fir (ESSF) zone. Approximately 75% of the pipeline route is within the BWBS biogeoclimatic zone. This zone occurs in lowland and montane areas. In northeastern British Columbia and northwestern Alberta, this zone occurs roughly as an extension of the Alberta Plateau north of 54°N latitude at elevations ranging from 230 to approximately 1,300 m. White spruce, black spruce, lodgepole pine, tamarack, trembling aspen, and balsam poplar are the major tree species in the BWBS. Forest fires are frequent throughout the zone, maintaining the forest in a variety of successional stages (DeLong *et al.* 1991).

There are two variants of the BWBS zone in the Project area. Variant classification is based on climax plant associations. The proposed pipeline RoW crosses the Peace variant (BWBSmw1) in the larger valleys (7%) and the Murray variant (BWBSwk1) at the foothills to mid-slope on the Rocky Mountains (70%). Climax forests in the Peace variant are dominated by white spruce and aspen. Climax forests in the Murray variant are dominated by white spruce or lodgepole pine.

The ESSF biogeoclimatic zone is found at the highest elevations in the area. This zone occurs below the alpine tundra in the Rocky Mountains. The Project area is within the Bullmoose variant (ESSFmv2). Forest cover in this moist cold region is dominated by lodgepole pine in young seral communities and Englemann spruce and subalpine fir in climax communities.

3.1.4 Fish and Fish Habitat

The affected watersheds along the pipeline route are known to support sport and non-sport fish species. Sport fish species, such as Arctic grayling, bull trout, mountain whitefish, lake char, northern pike, and walleye are considered native to these systems and relatively abundant and widespread in their distribution. Other non-native species such as brook trout, rainbow trout, and cutthroat trout are considered less common, although they are known to occur in the Narraway watershed. Various non-sport fish such as shiner, dace, chub, stickleback, and sucker are distributed throughout the stream and river systems in the area. Many of the fish populations are slow growing and late maturing (Dawson Creek LRMP 1999). Critical bull trout habitat has been identified as a key resource value in the Alberta

Plateau Resource Management Zone of the LRMP area. The proposed pipeline route will likely require aerial watercourse crossings at the Wapiti and Narraway rivers, and Red Deer Creek and will traverse other watersheds in the area, some of which may not require watercourse crossings.

A review of literature and information on fisheries resources associated with the affected watersheds included reports and file data from British Columbia Ministry of Water, Land and Air Protection (WLAP), Alberta Environment (AENV), Fisheries and Oceans Canada (DFO), consultant reports, scientific journals, on-line searchable government databases and personal communications with government personnel. A variety of fish species occupy the Wapiti River watershed and Narraway River watershed. Sport fish species, such as Arctic grayling, bull trout, and mountain whitefish, are considered native to these systems and relatively abundant and widespread in their distribution. Other non-native species such as brook trout, rainbow trout and cutthroat trout are considered less common although they are known to occur in the Narraway River watershed. Various non-sport fish such as shiner, dace, chub, stickleback and sucker are distributed throughout the stream and river systems in the study area. Table 3-1 lists the reported fish species known to inhabit watercourses in the vicinity of the Project and Table 3-2 lists the species known to be resident by watershed.

Table 3-1
Common and Scientific Names of Fish Species Reported to Inhabit Watercourses Within the Vicinity of the Project

Family	Common Name	Scientific Name
Sportfish		
Salmonidae	Bull trout	*S. confluentus* (Suckley)
	Brook trout	*S. fontinalis* (Mitchell)
	Rainbow trout	*Oncorhynchus mykiss* (Walbaum)
	Cutthroat trout	*O. clarki* (Richardson)
	Mountain whitefish	*Prosopium williamsoni* (Girard)
	Arctic grayling	*Thymallus Arcticus* (Pallas)
Esocidae	Northern pike	*Esox lucius* (Linnaeus)
	Walleye	*Stizostedion vitreum* (Smith)
Gadidae	Burbot	*Lota lota* (Linnaeus)
Non-sportfish		
Catostomidae	Longnose sucker	*Catostomus catostomus* (Forster)
	White sucker	*C. commersoni* (Lacepede)
	Mountain sucker	*C. platyrhynchus* (Cope)
Cyprinidae	Lake chub	*Couesius plumbeus* (Agassiz)
	Pearl dace	*Margariscus margarita* (Cope)
	Fathead minnow	*Pimephales promelas* (Rafinsque)
	Longnose dace	*Rhinichthys cataractae* (Valenciennes)
	Northern redbelly dace	*Phoxinus eos* (Cope)
	Finescale dace	*Chrosomus neogaeus* (Cope)
Percopsidae	Trout-perch	*Percopsis omiscomaycus* (Walbaum)
Gasterosteidae	Brook stickleback	*Culaea inconstans* (Kirtland)
Cottidae	Spoonhead sculpin	*Cottus ricei* (Nelson)
	Slimy sculpin	*C. cognatus* (Richardson)

* Mackay *et al.* (1990).

Table 3-2
Known Fish Species Distribution Along Pipeline Route by Watershed

Fish Species	Watershed		
	Murray River	Wapiti River	Narraway River
Bull trout	✓	✓	✓
Arctic grayling	✓	✓	✓
Mountain whitefish	✓	✓	✓
Rainbow trout	✓		✓
Slimy sculpin		✓	
Northern pike	✓		
Brassy minnow	✓		
Burbot	✓		
Longnose dace	✓		
Longnose sucker	✓		

Source: Ministry of Agriculture, Food, and Fisheries 2001

3.1.5 Wildlife and Wildlife Habitat

The northeastern region of British Columbia and the northwestern region of Alberta contain a broad range of habitat conditions for terrestrial wildlife and avian species. As a result, a high diversity of wildlife species has been identified as potential seasonal or year-round residents in these regions. Typical wildlife species known to the area as year-round residents include grizzly bear, black bear, bighorn sheep, mountain goat, wolf, cougar, fisher, wolverine, pine marten, moose, elk, caribou, deer, game birds, beaver and squirrel. Some migratory bird species reside in the area seasonally. In total, 246 species of wildlife are expected to reside in the region surrounding the proposed pipeline route, including 51 mammals, 188 birds, and 7 herptiles. Of the 246 wildlife species expected or known to occur within the region (see Appendix J in AXYS 2001a), 19 species were considered to be species of special status. These species were identified to be of management concern based on their status federally, provincially or regionally. Four of these species were selected as key indicator resources for the environmental assessment because they have been identified as "key indicator species" in the area (Dawson Creek LRMP 1999) and are particularly vulnerable to cumulative land use pressures. Other species of special status (e.g., upland sandpiper and LeConte's sparrow) generally have a very restricted range within the study area and/or not as vulnerable to conversion of forests to grasslands.

The following paragraphs highlight some important species found in the area.

Ungulates

Seven ungulate species occur in the vicinity of the Project: caribou; elk; moose; Rocky Mountain bighorn sheep; mountain goat; mule deer; and white-tailed deer. Of these species, caribou are of particular concern because of the sensitivity of their populations on locally and regionally occurring wintering and calving ranges (Hervieux; Backmeyer, pers. comm., cited in AXYS 2001a). Rocky Mountain bighorn sheep are also of regional concern, but their habitat will be unaffected by the proposed Project. Similarly, isolated populations of mountain goats do occur in the area, but their habitat will also be unaffected by the proposed Project. Mule and white-tailed deer are considered less vulnerable to oil and gas development as their populations and key habitats are considered relatively secure and well-distributed in both British Columbia and Alberta (AFLW 1991; AEP 1996). Both elk and moose are considered not at risk but may require special management to address concerns related to low populations, limited provincial distribution, and particular biological features (*e.g.*, winter range). The primary sources of stress on elk and moose populations include sport hunting, poaching, predation, habitat loss, and reduced habitat effectiveness. The proposed route intersects ungulate winter range, with moose and elk winter range occurring along the Huguenot Valley. Despite some potential reductions in habitat effectiveness due to human activities and vehicle traffic along roads that have already occurred, these wintering ranges are considered important for regional elk and moose populations.

The woodland caribou is considered a sensitive species both federally and provincially. Caribou in the proposed project area are represented by both the northern and mountain ecotype. In Alberta, caribou are confined to several large and distinct areas of the northern boreal forest and Rocky Mountains, and the herd is estimated to be as few as 3,500 (AEP 1996). Specifically, there are approximately 150 caribou in the Narraway area that summer in the mountains, but move into the boreal plains of Alberta for the winter (Hervieux 2000). In British Columbia, caribou abundance is considered to be low (*i.e.*, 1 caribou per 25-250 km^2) to moderate (*i.e.*, 1 caribou per 3.4-25 km^2) in the proposed project area (MELP 1988).

The Project traverses identified caribou habitat, as well as general ungulate winter range (Hervieux, R. 2000; Backmeyer, pers. comm., cited in AXYS 2001a). The open coniferous forests and bogs in the Project area provide important low elevation winter habitat for an inter-provincial caribou population (Dawson Creek LRMP 1999). Summer range is considered good, while winter range is limited. Habitat capability and suitability is considered to be moderate in the area (MELP 1997).

The conservation of caribou is ranked moderately high priority in the Hart Ranges in British Columbia (ranked fifth out of 13 regions in British Columbia) in the Hart Ranges in British Columbia, based on four criteria (population viability, habitat threats, level of habitat protection, habitat capability/suitability; Simpson, *et al.* 1997). Management of caribou requires maintenance of some old growth forest stands, as well as access management (Dawson Creek LRMP 1999). Specifically, minimizing fragmentation or development of new access routes in important low elevation caribou habitat is prioritized (Dawson Creek LRMP 1999). The season for recreational hunting for woodland caribou in Alberta was terminated in 1981, but caribou are hunted in British Columbia. Hunting for woodland caribou by First Nations is opportunistic.

Carnivores

Large carnivore species that occur in the region of the proposed Project include grizzly bear, black bear, wolf and cougar. Grizzly bears range throughout the region encompassing the proposed Grizzly Extension Pipeline route (AFLW 1990; MELP 1998). Populations in Alberta and British Columbia are generally considered to be vulnerable due to adverse environmental effects on bear habitat and populations from past and ongoing human activities. On the British Columbia side, "good quality foothills and plateau habitats" generally characterize the region encompassing the pipeline route (MELP 1996). In British Columbia, management of grizzly bear populations and habitats is facilitated through Grizzly Bear Population Unit (GBPU) strategies, and in the Project area is guided through the Dawson Creek Land and Resource Management Plan (1999). Currently, information is unavailable on population estimates and key provincial strategies at the GBPU scale. Land management direction provided in the Dawson Creek LRMP for the Foothills Resource Management Zone (RMZ) stipulates the need to manage medium and/or high capability grizzly bear habitat to assist in sustaining viable, healthy grizzly bear populations. Management of access and maintenance of corridor integrity are two related themes identified in the LRMP that will affect the goals regarding grizzly bear population and habitat management.

In Alberta, the pipeline route intersects the western portions of two Grizzly Bear Management Areas (BMAs 4A and 2B) in which grizzly bears are considered an important, resident species. Nonetheless, intensive habitat and bear-human conflict management and conservation programs are recommended in order to sustain grizzly populations in the northwestern region of the province (AFLW 1991). In both BMAs intersected by the pipeline, human-caused mortality over the last 20 years has been estimated to have exceeded sustainable levels based on extrapolated populations densities (9 to 12 grizzly bears/1,000 km^2) (AFLW 1991).

Grizzly bears may occur and use habitat throughout the year in the region encompassing the proposed pipeline project. In general, grizzly bears use a wide variety of habitat types, with general preference for semi-open, mesic habitats with minimal human intrusions (Craighead and Mitchell 1982; IGBC 1987; AFLW 1990). In their use of different seasonal habitats, grizzly bears range widely (*e.g.*, 200 km^2 to 2,100 km^2 for males in Kananaskis Country; 100 km^2 to 400 km^2 for females) (IGBC 1987; Carr 1989).

Furbearers and Small Mammals

Provincial trapper harvest records indicate a minimum of 15 species of furbearers are harvested in the Project area. While specific information on population sizes and distributions of these species is not available, some general inferences can be made. Those species harvested regularly are assumed to be reasonably abundant and well distributed within suitable habitats occurring in and around the Project area (*e.g.*, beaver, coyote, lynx, weasel, mink, marten, red squirrel). None of these species are considered at risk by provincial or federal authorities (AEP 1996; COSEWIC 2000). Fisher and wolverine have populations that are considered to be at some level of risk, while marten are considered to be a regionally important trapped species.

In North America, marten range as far north as the tree limit stretching from east to west coast. The southern boundary of their range roughly coincides with the Canada-U.S. boundary, however, they are generally absent from the southern portions of the prairie provinces (Strickland, *et al.* 1982). In British Columbia, marten occupy late-successional forest habitats throughout most of the province, existing in the greatest densities in coastal old-growth forests. They are generally considered common in most of these habitats, except in the province's dry interior (Ponderosa Pine biogeoclimatic zone), where their occurrence is considered sporadic (Stevens and Lofts 1988, Stevens 1995).

Marten in the northern boreal forest are generally associated with late successional stands of mesic conifers especially those with complex physical structure near the ground (Buskirk and Powell 1994). They prefer stands with various age and size classes since these stands provide a greater diversity and abundance of foraging areas and protective cover than do even-aged stands. Marten are opportunistic predators and will feed on a variety of small animals that are characteristic of boreal forest environments, including red squirrel, red-backed vole, snowshoe hare, and numerous other small birds and mammals.

Avian Species

Approximately 187 bird species may occur within the Project area. Information on bird species occurrences, however, is derived mostly from interpolation of secondary sources of information. This information includes anecdotal accounts, survey information, and general knowledge on species ranges (Campbell, *et al.* 1990a; 1990b; Campbell, *et al.* 1997; Semenchuk 1992) and survey results from similar and geographically proximal ecosystems (AXYS 1995; Strom, *et al.* 1995; Booth and Merkens 1999).

Numerous species of waterbirds occur within the Peace River District including loons, waterfowl, herons, rails, cranes, shorebirds, and gulls. Breeding and staging wetlands are important habitat for resident and migrating waterfowl and shorebirds and are, therefore, considered sensitive to project impacts. Of the waterbird species, four are considered sensitive species in the region: American Bittern, Trumpeter Swan, Upland Sandpiper, Yellow Rail.

Approximately 19 species of raptors may breed in the region encompassing the proposed Project (AXYS 2001; Campbell *et al.* 1990b; Semenchuk 1992). Of the 19 species, 2 are considered at risk either provincially and/or federally: Broad-winged Hawk, Short-eared Owl.

A large number of passerine species breed within and/or migrate through the Project area. Six passerine species, Philadelphia Vireo, Cape May Warbler, Black-throated Green Warbler, Connecticut Warbler, Canada Warbler, and Nelson's Sharp-tailed Sparrow, have been identified as species of concern for this Project (AXYS 2001a).

Reptiles and Amphibians

Four species of amphibians and two reptiles may be found in the Project area. However, none of these species are currently at risk either federally or provincially in British Columbia or Alberta.

The four amphibian species (long-toed salamander, western toad, boreal chorus frog, and wood frog) will use various types of wetlands for breeding including lake margins, marshes, small ponds, seeps, creeks, backwater channels of rivers, and various man-made wetlands. All of these species are primarily terrestrial to varying degrees outside the breeding season and all species hibernate in upland areas. The distance that these species may wander from wetlands during the summer is variable and largely unknown.

The two reptile species include the red-sided garter snake and the wandering garter snake. Few observations of the wandering garter snake have been made in northeastern British Columbia and northwestern Alberta (Gregory and Campbell 1987; Russell and Bauer 1993). These two species are communal denning species that will use rocky south facing slopes or similar areas that allow the snakes to hibernate below the frost line. Both species of garter snake are most often found near water (Gregory and Campbell 1987).

3.1.5.1 Key Indicator Species

Among the many wildlife species that occur in the area, four species have been identified as "key indicator species" in the Dawson Creek LRMP (1999): woodland caribou; grizzly bear; marten; and black-throated green warbler. Species such as caribou and grizzly bear are particularly vulnerable to cumulative land use pressures and stress from the presence of human activity. In addition, caribou and grizzly bear require large seasonal territories. Therefore, they are considered good indicators of overall ecosystem health—if the habitat and health of caribou and grizzly bear are protected, additional species that also reside within their range will, by default, also be protected. Furthermore, caribou, grizzly bear, and black-throated green warbler are listed provincially, while marten are considered an important furbearer species regionally. Also, the black-throated green warbler is commonly used in forestry-related monitoring in British Columbia.

3.1.6 Regional Economy and Land Use Planning

The northeastern region of British Columbia and the northwestern region of Alberta also support a healthy resource-based economy, including mining, oil and gas development, agriculture, forestry, hunting, guide outfitting, trapping, and tourism activities. Numerous recreation opportunities are available, including commercial recreation outfitters, non-commercial hunting, camping, and hiking. Designated recreation areas in northeastern British Columbia and northwestern Alberta include the Stony Lake and Wapiti Lake Forest Recreations Areas, and the Two Lakes Recreation Area. As well, backcountry recreation opportunities are easily accessible via resource roads connected to the provincial and inter-provincial road network. Industrial activities, commercial and non-commercial recreation activities in this area take place in all seasons.

Of all the resource development activities that take place in the northeastern portion of British Columbia and the northwestern portion of Alberta, oil and gas development, mining, and forestry dominate the industrial landscape. Development of several gas fields in the region has resulted in exploration and development activities, including seismic, pipeline construction, and associated facilities, access roads, and well sites. Exploration and extraction of minerals is also an important activity regionally. There are no known areas of active aggregate mining near the pipeline route, although sand and gravel are mined elsewhere in the region for road construction, industrial development, and building structures. Coal mining has been a dominant resource development in the Tumbler Ridge area, but has recently declined with the closure of the Quintette Coal Mine in August 2000, and the planned closure of the Bullmoose Coal Mine in 2003.

Trapping occurs throughout the northeastern region of British Columbia and the northwestern region of Alberta, and is an important traditional use, although with diminishing commercial importance. Eleven registered traplines in British Columbia and seven fur management areas in Alberta are in the vicinity of the proposed pipeline route. Species most commonly harvested include marten, beaver, and squirrel. Hunting is the most common non-commercial resource use. Moose are principally taken, although some hunting of elk, caribou, deer (white-tailed and mule), black bear, and game birds (mainly grouse) also occurs.

The closest community to the proposed alignment is Tumbler Ridge, BC, approximately 30 km west of the westernmost point of the proposed Project. Other surrounding communities include Chetwynd and Dawson Creek in British Columbia, and Beaverlodge and Grande Prairie in Alberta. As well, there are numerous small communities and rural residents surrounding these larger population centres in both Alberta and British Columbia. The communities in this area rely on resource based industries for a substantive portion of their local incomes.

Recently, in northeastern British Columbia, local communities, government agencies, industry representatives, and other stakeholders, participated in a detailed land planning process which resulted in the Dawson Creek LRMP in 1999. The LRMP sets out land planning objectives and guiding principles for a large portion of northeastern British Columbia. The proposed pipeline will be located in the Foothills and Alberta Plateau RMZ as designated in the LRMP. General management direction identified for both zones allows for resource development activities, balanced with fish, wildlife, recreation, air quality, Aboriginal, recreation and tourism, and culture and heritage objectives. In these two RMZs, oil and gas development is an accepted activity and is recognized as a key sector that sustains local economies. In other RMZs in the LRMP, priority is given to the management of protected areas and critical wildlife habitat, for example.

In the Foothills RMZ, the overall land and resource management objective is the sustainability of significant resource values including deciduous and coniferous timber resources, oil and gas, coal, fish and wildlife, recreation, range and cultural resources. Most of this RMZ is well developed and has a high potential for future resource developments. Most of the RMZ has well-developed roads, seismic lines, pipeline corridors and trails, providing ready access (Dawson Creek LRMP 1999). As well, the Alberta Plateau RMZ is well developed and has a high potential for future resource development. The sustainability of resource values including deciduous and coniferous timber resources, oil and gas, coal, fish and wildlife, recreation, agriculture, range and cultural resources is the overall land and resource management objective for the Alberta Plateau RMZ.

In Alberta, no equivalent land use plan to the Dawson Creek LRMP exists, although there is a regional-level strategy that has recently been initiated to address integrated land use planning and environmental issues in the Northern East Slopes region of Alberta. The Northern East Slopes (NES) Strategy is an initiative of the Alberta Government to integrate economic, environmental and community values into its planning process for sustainable development. The NES Strategy will involve a cross-section of stakeholders in the development of resource management objectives and land use planning guidelines in the future. One of the desired outcomes of the NES Strategy is a clear strategic direction for managing resources in the region, in addition to identifying sub-regional and local planning priorities. This will be done with a consideration of economic, environmental, community, and Aboriginal interests.

Few Special Places, as designated under the Alberta provincial Special Places 2000 Program, are located in the northwestern region of the province. Recently, the Minister of Environment announced the designation of several new Special Places in the Boreal Forest Region, which encompasses the Alberta segment of the proposed pipeline; however none of these sites will be affected by the route.

3.1.7 Current Aboriginal Land Use and Archaeological Resources

There are seven Aboriginal communities in the vicinity of the proposed pipeline route. As well, the potential for historical resources along the alignment has been initially identified. Discussions with these communities have included a commitment to undertake an integrated traditional use and archaeological study. This work is in progress and will greatly enhance knowledge of the current use of lands for traditional purposes and of the archaeological resources along the proposed pipeline route. West Moberly First Nation is located approximately 30 km north of Chetwynd, along Highway 29 at Moberly Lake. The population grew from 51 in 1991 to 70 in 1996 and it remains at this level in 2000.
The McLeod Lake First Nation is located along the shores of McLeod Lake, 150 km north of Prince George. Over 200 Band members live on the reserve.

The Saulteau First Nation community is located at the east-end of Moberly Lake on Highway 29. The on-reserve population increased from 160 in 1991 to 179 in 1996 to 325 people in 2000.

The Kelly Lake community is located 120 km southeast of Dawson Creek near the Alberta border. Members of both the Kelly Lake First Nation and the Kelly Lake Cree Nation reside in the community. Population at Kelly Lake was estimated at 140 in 1991 and 161 in 1996.

The Horse Lake First Nation has two reserves: the Horse Lakes Reserve located 60 km northwest of Grande Prairie, in the County of Grande Prairie No. 1; and the Clear Hills Reserve located 50 km northwest of Fairview. Most members of the community live on the Horse Lakes Reserve. In 2000, the on-reserve population was estimated to be 289 people.

The Aseniwuche Winewak Nation (AWN) was formalized in September 1994 by the joining of six Aboriginal settlements surrounding the town of Grande Cache. The settlements are located along Highway 40, within 40 km of the town of Grande Cache. Approximately 350 members of the AWN live in the six settlements.

The initial assessment of archaeological and historical resources in the Project area included a site file search of databases for Alberta and British Columbia, as well and a preliminary field reconnaissance by helicopter. Areas of low, moderate, and high archaeological potential were identified in association with the proposed pipeline alignment. Areas of high to moderate archaeological potential include terraces or benches near rivers and streams, pronounced topographic features such as summits and escarpments, well drained features in otherwise saturated terrain, areas providing exceptional views or outlooks, and proximity to mineral licks, caves, hotsprings, and eskers (Landsong Heritage Consulting Ltd. 2000).

The Project area also has a high potential for Culturally Modified Tree (CMT) sites. CMTs have been identified in two locations in proximity to the proposed pipeline route (Landsong Heritage Consulting Ltd. 2000). CMTs, associated with a narrow corridor of pack trails, have been identified on the south side of Belcourt Creek. The trails along Belcourt Creek are known quite intimately by some of the Aboriginal people who now reside at Kelly Lake (Landsong Heritage Consulting Ltd. 2000). A second area containing CMTs is located just west of an existing BP/Amoco well site near the existing well sump (Landsong Heritage Consulting Ltd. 2000). A small bank delineates the boundary of a mature conifer forest. An old pack trail with associated CMTs follows the bottom of the bank and skirts an area of muskeg and standing water lying further south.

Other archaeological sites and burial sites were identified in the vicinity of, but not on, the proposed alignment. A more detailed, field-based traditional use and archaeology study to confirm and build on the findings of the initial overview study conducted with resource people from the communities. Work was completed in BC but is still in progress in Alberta.

3.2 Additional Submissions

Further details on the environmental setting for the Project are addressed in Chapters 6 through 15.

3.3 Conclusion

The information provided by Westcoast regarding the environmental setting is satisfactory.

Chapter 4

Environmental Assessment Methods

4.1 Westcoast Submission - Revised Draft CSR - 4 January 2002

4.1.1 Approach

The approach employed in this CSR provides an integrated evaluation of project related and cumulative environmental effects combining the environmental assessment framework described in AXYS (2001), Hegmann, *et al.* (in press) and in Barnes, *et al.* (2000). These methods are based on the principles of environmental assessment described in Canadian Environmental Assessment Agency (the "Agency") guidance (e.g., FEARO 1994; CEAA 1999). The approach is designed to address the scope of the Project.

The approach follows eight basic steps to assess environmental effects, including the consideration of cumulative environmental effects, in an integrated way. These are:

1. Identify the issues through scoping and select Valued Environmental Components ("VECs") on which to focus the environmental assessment;
2. Establish boundaries for the environmental assessment and residual environmental effects rating criteria for determining the significance of project-related environmental effects, for each VEC;
3. Identify those past, present and likely future projects that could result in cumulative environmental effects in combination with those of the Project;
4. Identify environmental effects of project activities, by project phase, including those resulting from interaction of the Project with the environmental effects identified for projects or activities that have been or will be carried out (cumulative environmental effects), and also the changes to the Project caused by the environment;
5. Evaluate project-related environmental effects using the criteria identified in Agency guidance for the evaluation of significance (FEARO 1994; CEAA 1999) and in consideration of the proposed mitigation;
6. Evaluate the cumulative environmental effects of the Project in combination with those of other past, present and likely future projects (identified in Step 3) in consideration of proposed mitigation;
7. Evaluate the significance of project-related environmental effects and consider the contribution of the Project to the cumulative environmental effects; and
8. Outline a monitoring and follow-up program including, as appropriate, those recommended to address cumulative environmental effects.

Although these steps are somewhat sequential, they often are and in many cases should be undertaken concurrently.

The approach to cumulative environmental effects assessment for this project is modeled upon the Agency guidance (CEAA 1999) and Hegmann, *et al.* (in press), which identify five basic steps namely: scoping; analysis of effects; identification of mitigation; evaluation of significance; and follow-up. The eight-step methodology above integrates these five steps for the evaluation of cumulative environmental effects.

CEAA (1999) notes that environmental assessments of a single project under *CEAA* must determine if that project is incrementally responsible for adversely affecting a VEC beyond a defined acceptable point. Although the total cumulative environmental effect on a VEC due to many actions must be considered, it should be recognized that the proponent of a proposed project under review cannot be held responsible for past or future actions and associated cumulative pressures not under their control. Therefore, the relative importance of a project's contribution to existing or future levels of cumulative effects is a key consideration for the assessment of the project under review.

4.1.2 Environmental Assessment Steps

Step 1—Scoping of Issues and Selection of Valued Environmental Components

Scoping involved consultation with stakeholders, including the general public, responsible authorities under *CEAA*, regulatory authorities and Aboriginal communities to identify the issues that needed to be addressed in the environmental assessment. It also involved the application of professional judgement by authors of the environmental assessment report, including the consideration of baseline studies and research undertaken for the Project.

A key objective during the issues scoping process was to identify the most appropriate way to organize or "package" issues into VECs that make sense for the focused analysis of potential environmental effects. For the biological and physical environment, VECs may represent "key" or "indicator" species, communities, species groups, or ecosystems, as well as "pathways" (*e.g.*, air, water), which act as media for the transfer of environmental effects. VECs may also reflect issues that are socially, culturally or economically of value. The ultimate selection of VECs for this project reflects an informed understanding of the potential project-environment interactions, the importance of components to ecological integrity, their sensitivity to the planned perturbations, and societal values. For cumulative environmental effects, VECs were selected to reflect the potential for cumulative environmental effects arising from the Project in combination with projects that have been or will be carried out.

The scoping process (Section 5.0) in this CSR serves to document the source of issues and how and where these have been addressed in the environmental assessment. While scoping has identified those issues that may lead to project-related environmental effects, it also identifies those particular effects that may ultimately contribute to cumulative environmental effects. This can include consideration of issues that may relate to several VECs (*e.g.*, issues related to increased access in a region may affect several VECs including wildlife, traditional land use, heritage and archaeological resources, fish and fish habitat). Scoping conducted in Section 5.0 identifies issues for cumulative environmental effects assessment where it is determined that project-related environmental effects may overlap with those of other projects and activities.

Step 2—Establish Boundaries and Residual Environmental Effects Rating Criteria

Boundaries

The determination of boundaries focuses the scope of work, allowing for a meaningful analysis of potential environmental effects associated with a project. There are two distinct types:

- temporal and spatial boundaries of the Project and the VECs; and
- administrative and technical boundaries of the assessment.

The first type of boundary is defined by the temporal and spatial characteristics of the Project and various VECs. These boundaries encompass those periods and areas during, and within which, the VECs are likely to interact with, or be influenced by, the Project. These boundaries may extend beyond physical project limits, even the limits of potential direct interactions between the Project and the VECs, particularly in the case of migratory species, or regional or national socio-cultural and economic systems.

Where relevant, the second type of boundary is used to address the limitations on the scope of, or approach to, work during the assessment of environmental effects. These boundaries are referred to as administrative boundaries and technical boundaries to the assessment, and are imposed by such factors as finite resources of data, time, cost, and labour, as well as technical, political, or administrative reasons or jurisdictions. Administrative boundaries refer to the temporal and spatial dimensions imposed on the environmental assessment for political, socio-cultural, and economic reasons. Technical boundaries represent the technical limitations on the ability to evaluate or predict potential environmental effects of the Project.

Cumulative environmental effects assessment tends to expand the spatial and temporal boundaries of the Project-related environmental effects assessment (CEAA 1999). These larger boundaries are helpful in evaluating cumulative environmental effects on such things as economic and social systems (e.g., regional economy), or in the case of wildlife for example, the range of a migratory population, and progressive incursion of humans in hinterland areas. As noted by CEAA (1999), setting boundaries for cumulative environmental effects relies less on special techniques, but more on the basics of environmental assessment:

- making conservative assumptions about the magnitude and probability of the environmental effect in the face of uncertainty (i.e., assume that the environmental effects will be greater rather than smaller);
- relying on professional judgement;
- practicing risk management; and
- using an adaptive approach.

To that end CEAA (1999) suggests establishment of a local study area in which obvious, easily understood and often mitigable environmental effects occur (i.e., project-related environmental effects). It is also suggested that regional study areas be established where there could be possible interactions with other actions, considering the interests of other stakeholders (i.e., for the evaluation of cumulative environmental effects). This assessment uses both approaches to spatial boundaries in this context, as appropriate.

Residual Environmental Effects Rating Criteria

Under *CEAA*, the determination of the significance of project-related residual environmental effects (i.e., effects after mitigation) is central to decision-making. Where clear thresholds or resource objectives are available (e.g., water quality guidelines), the determination of significance is relatively straightforward. However, for most VECs, such thresholds are not available, and the determination of significance relies on a more subjective evaluation based on the apparent sustainability of the VEC, and the resource objectives of the areas in question.

Several evaluation criteria have been recommended by the Agency (FEARO 1994) to assist in the determination of significance (*e.g.*, magnitude, geographic extent, ecological setting) in the absence of clear thresholds or resource objectives. However, the definition and application of these criteria are highly subjective, and any determination of significance using such criteria is similarly subjective. In addition, for biological VECs, these criteria are often not clearly or defensibly linked to important parameters, such as resource sustainability. Therefore, while these criteria can be used to characterize environmental effects and provide an indication of the nature and severity of project-related environmental effects, their use in evaluating significance has acknowledged limitations.

In the absence of clear resource objectives or thresholds, significant environmental effects can be defined as those effect of sufficient magnitude, duration, frequency, geographic extent, and/or reversibility (or other important criteria identified in the assessment) to cause a change in the VEC that will alter its status or integrity beyond an acceptable level. The qualified study team exercised professional judgement to develop these criteria in light of a wide range of factors.

Step 3 - Identification of Other Past, Present and Future Projects in the Project Area

A crucial component of assessing cumulative environmental effects under *CEAA* includes the identification of past, present and likely future projects and activities in the study area that could interact in combination with the environmental effects of the Project. This assessment relies, to a considerable extent, upon the guidance of CEAA (1999) and methods of Hegmann *et al.* (in press) to determine how these "other actions" might be identified. This guidance offers a number of considerations including the important issue of distinguishing between certain, reasonably foreseeable and hypothetical future actions (*i.e.*, how far to go into the future) or how far back in the past to consider cumulative environmental effects. Also considered are induced actions (*e.g.*, recreational access). For the purposes of this environmental assessment, other projects included in quantitative cumulative effects analyses included those activities with existing footprints on the landscape and those that have been formally approved, with spatially explicit footprints. Other potential future projects that did not meet these criteria have been dealt with in a more qualitative fashion.

Step 4 - Identification of Project-related Environmental Effects

This step involves the identification of measurable VEC-specific, project-related environmental effects (*i.e.*, project-VEC interactions) and a description of issues and concerns regarding key interactions. In order to accomplish this, project activity-environmental effects interactions are described for each VEC. Those measurable effects with the potential to overlap with the effects of other past, present and likely future projects identified in Step 3 are identified for further consideration under the cumulative effects assessment (Sections 6 to 13). Also identified are the changes of the Project caused by the environment (e.g., extreme natural events such as floods or earthquakes Section 14).

Step 5 – Evaluation of Project-related Environmental Effects

The next step in the assessment process consists of the evaluation of potential residual environmental effects of the Project, by project phase, in light of residual effects rating criteria established in Step 2. The purpose of this analysis is to evaluate the interactions between project activities and the VECs and to determine the nature and extent of residual environmental effects, *i.e.*, those environmental effects that may persist after all mitigation strategies have been implemented.

The concept of classifying environmental effects simply means determining whether they are adverse or positive, upon consideration of mitigation measures. Mitigation includes environmental design, route selection, environmental protection strategies, and mitigation specific to the minimization or control of potential adverse environmental effects of a particular VEC. As appropriate, mitigation discussion refers to more detailed planning documents prepared for the Project, such as the EPP. As required by *CEAA*, these measures must be technically and economically feasible. In the case of positive environmental effects, enhancement opportunities are considered (*e.g.*, local employment benefits).

Upon evaluating the nature and extent of project-specific environmental effects, a determination with respect to significance is made. This determination takes into account the environmental effects rating criteria previously described in Step 2.

Step 6 – Analysis of Cumulative Environmental Effects

To identify cumulative effects issues for this CSR, three basic questions have been considered (as recommended by Hegmann et at 1999):

1. Will the project have measurable effects on the resource in question?
2. Will these measurable project effects have the potential to overlap with or incrementally add to those of other land use activities in a meaningful fashion? and
3. Will project contributions to regional cumulative environmental effects have the potential to measurably change the health or sustainability of the resource in question?

For this Project, the potential contributions to environmental effects from the pipeline have been discussed in light of the land use settings along the route to ensure that assessment resources were not spent on irrelevant issues. For example, a large portion of the proposed RoW will be sharing easement with or abutting to an existing road or utility corridor, so that portion of the new pipeline will not contribute to regional cumulative access potential. Conversely, where new RoW is developed in a relatively remote area, this becomes a "trigger" for cumulative effects consideration.

In this environmental assessment, those areas where CEA triggers exist are identified and appropriate methods have been employed to evaluate project-related, overall cumulative environmental effects and the contribution of the Project to those cumulative environmental effects. These are discussed in the analyses associated with each CEA trigger. The CEA triggers are identified in Section 5.1.4.

In evaluating cumulative environmental effects, the effectiveness of proposed mitigation for both project-related environmental effects and cumulative environmental effects has been considered. Westcoast has provided comprehensive mitigative programs to address the environmental effects of the Project. Westcoast is also committed to access management mitigation strategies that involve proactive consultation and regional access planning with others active in the Project area and adaptive management over time with the objective of achieving an overall lessening of cumulative environmental effects. These are provided and discussed in the respective sections of this CSR.

Step 7 – Analysis and Prediction of the Significance of Project-related and Cumulative Environmental Effects

Project-related Environmental Effects

The analysis and prediction of the significance of project-related environmental effects encompasses the following:

- Determination of the significance of residual environmental effects for each phase of the Project and for the Project overall; and
- For any predicted significant environmental effects (as per the guidance of the Agency (FEARO 1994)),
  - Establishment of the level of confidence for predictions, and
  - Determination of scientific certainty and probability of occurrence of the predicted residual environmental effects.

Upon completion of the evaluation of the Project-related environmental effects in Step 5, the residual environmental effects are assigned an overall rating of significance for each of the Project phases (*e.g.*, construction, operation, decommissioning, and malfunctions, accidents, and unplanned events) and for the Project overall.

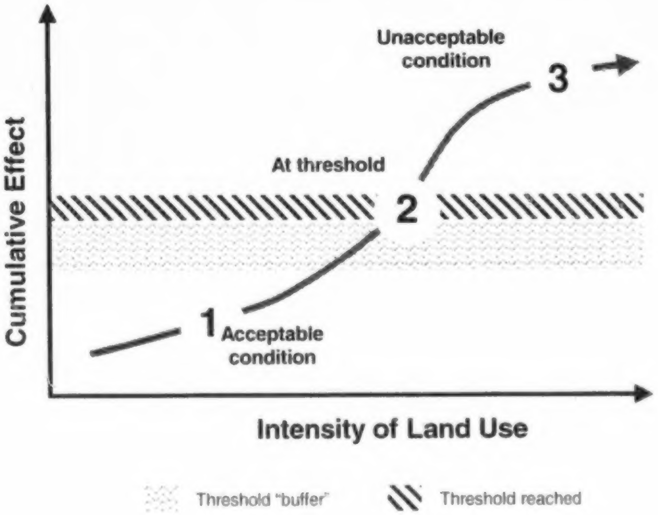
This overall determination considers all residual environmental effects and represents an integrated summary of the residual environmental effects of the Project. These are presented in environmental effects assessment summary tables that provide a phase-by-phase rating of project-related environmental effects. Based on the rating of residual environmental effects in the context of defined significance thresholds, the significance of the Project-related environmental effects on each VEC is determined. Where significant adverse or positive residual environmental effects are predicted, the likelihood of occurrence is discussed.

Cumulative Environmental Effects

The significance of cumulative environmental effects ideally is determined based on a comparison of the effect to a threshold (Hegmann, *et al.* in press). A threshold is a point at which a resource undergoes an unacceptable change or reaches an unacceptable level. Thresholds may be based on ecological attributes (*e.g.*, habitat availability, wildlife populations), physical-chemical attributes (*e.g.*, air or water contaminant concentrations), land and resource use attributes (*e.g.*, road densities, hunting harvest) or social attributes (e.g., acceptable perceived change, planning objectives). As land use pressures increase, the adverse effects on a resource also increase. At relatively undisturbed conditions, the condition of the resource may be acceptable (Point 1 in Figure 4.1). Eventually, some condition is reached at which a threshold is met (Point 2), after which the threshold has been exceeded (Point 3) and sustainability of the resource becomes questionable. A "buffer" can be used as an early-warning system for management purposes to reduce or halt the advancement of the effect towards the threshold. The acceptability of incremental contributions to cumulative environmental effects from proposed projects must also be viewed from the perspective of:

- Resource objectives and priorities for the project area;
- The relative change in the resource likely to occur from project contributions to cumulative environmental effects; and
- The potential for multi-stakeholder driven recovery initiatives for the resource in question that would accommodate additional development in the area, and the willingness of the proponent to participate in such initiatives.

Figure 4-1
Threshold Levels for Cumulative Environmental Effects of Development on VECs



In some cases, thresholds have been established through regulatory or policy means such as legislation or local-level or regional land planning processes. However, in many cases, agreed-upon or regulatory thresholds do not exist. In that case, qualitative conclusions are made. These rely on professional judgment, on the recognition of the degree of existing disturbances and regional trends in development, on regional resource objectives and priorities, and on the contribution of project-specific and possible regional mitigation measures in ameliorating environmental effects. The cumulative environmental effects analysis in this CSR attempts to establish the context of cumulative environmental effects in this manner.

Step 8– Monitoring and Follow Up

As part of the environmental effects analysis, appropriate monitoring and follow-up are described. In developing a follow-up program, the results of Steps 1 through 7 were reviewed to identify interactions, where there is some uncertainty about environmental effects and cumulative environmental effects predictions, where substantial environmental effects are predicted, or in areas of particular sensitivity.

Changes to the Project that may be caused by the Environment

In addition to the eight-step process for evaluating the environmental effects of the Project, including cumulative environmental effects, it is also necessary to consider those changes to the Project that may arise as a result of the environment. For example, natural phenomena like forest fires, floods and earthquakes can result in environmental effects as defined in *CEAA*. These environmental effects are addressed in a separate section at the end of the environmental effects analysis (Section 14).

4.2 Additional Submissions

Further details on the environmental assessment methods are addressed in Chapters 6 through 15.

4.3 Conclusions

Westcoast's approach to environmental assessment and the associated steps used, are generally satisfactory. One aspect of Westcoast's approach does warrant comment. Westcoast submitted that, for the purpose of the wildlife assessment, a significant Project effect would be a negative long-term effect of high magnitude. In Westcoast's view, a high magnitude effect represents a change of greater than 10 percent in the measurable parameter of interest. However, in this case, the primary concerns associated with the VECs are related to cumulative effects and situations where the requirements for sustaining that VEC may already be at or exceeding threshold levels. Accordingly, this aspect of Westcoast's approach was considered to be of little value to the assessment of the Project and was not relied on in arriving at the conclusions and recommendations. The information relied on in reaching conclusions in respect of cumulative effects is discussed in Chapter 15.

Chapter 5

Scoping of Issues

5.1 Westcoast Submission - Revised Draft CSR - 4 January 2002

5.1.1 Scoping

5.1.1.1 NEB Scope Determination

The NEB issued the "Scope of the Environmental Assessment" for the Grizzly Extension Pipeline and Weejay Lateral Pipeline on May 17, 2001 (Appendix A). The scope determination set out the scope of the Project, the factors to be considered, and the scope of the factors to be considered.

5.1.1.2 Public and Stakeholder Consultation

Public and stakeholder consultation activities were undertaken by Westcoast during the preparation of the Application to the NEB and the associated baseline EIA and socio-economic assessment. A summary of activities undertaken and stakeholders consulted is provided in the Application to the NEB (Westcoast 2001a). A summary of issues and concerns identified throughout public and stakeholder consultation is provided in Section 5.1.1.7.

5.1.1.3 Regulatory Consultation

Regulatory consultation was undertaken by Westcoast during the preparation of the Application to the NEB and the associated baseline EIA and socio-economic assessment. A summary of activities undertaken and regulatory agencies consulted is provided in the Application to the NEB (Westcoast 2001a). A summary of issues and concerns identified throughout consultation with regulatory agencies is provided in Section 5.1.1.7.

5.1.1.4 Aboriginal Discussions

Extensive discussions with Aboriginal communities were undertaken by Westcoast during the preparation of the Application to the NEB and the associated baseline EIA and socio-economic assessment. A summary of First Nations and Metis groups talked to and the timing of these activities was provided in the Application to the NEB (Westcoast 2001a). A chronology of discussions since January 2001 is provided in Appendix E of the Westcoast Revised CSR, 4 January 2002. A summary of issues and concerns identified by the First Nations groups and Metis is provided in Section 5.1.1.7. In the vicinity of the proposed Project, there are seven established Aboriginal communities that were involved in Project communications: Horselake First Nation, Kelly Lake First Nation, Kelly Lake Cree Nation, McLeod Lake Indian Band, Saulteau First Nations, West Moberly First Nation, and the Aseniwuche Winewak Nation of Canada. Although the Saulteau First Nations has declined to participate in ongoing discussions, they have communicated general concerns regarding their interest in the area. The Treaty 8 Tribal Association has also identified issues and concerns related to the proposed Project. Public Open House meetings in British Columbia and Alberta provided additional opportunities for Aboriginal people to receive information about the Project and to bring forth questions and concerns.

All discussions with Aboriginal communities have been carried out in accordance with the Westcoast Corporate Aboriginal Policy Statement (Aboriginal Relations Sharing a Vision (Westcoast undated)). During discussions with Aborignal groups, Westcoast developed a Project-specific Aboriginal Employment Strategy with the objective of deriving mutual benefits by creating employment and training opportunities for local Aboriginal people with respect to the Project (see also Section 13.1.4.2.1). Westcoast will provide for Aboriginal participation in the proposed Project to individuals and businesses on a competitive and qualified basis. Westcoast has committed to ongoing dialogue with Aboriginal groups and organizations to raise awareness about the Project and to provide information about the timing and nature of employment opportunities, contractor and employment prerequisites and recruitment procedures. As part of the Strategy, an inventory of interested individuals and contractors has been developed.

5.1.1.5 Baseline Studies and Research

Baseline studies and research were undertaken as part of the Application to the NEB and the supporting EIA and socio-economic assessment. The baseline information presented in those documents by AXYS (2001a) and submitted to the NEB (Westcoast 2001a) and augmented by subsequent field studies to provide seasonal data and address route refinements (See Section 2.1.10.4) provided the source for the description of existing conditions of each Valued Environmental Component.

5.1.1.6 Professional Judgement

Professional judgement was applied in the environmental effects analysis and through the selection of Valued Environmental Components in this CSR, building upon that of AXYS (2001a) as submitted to the NEB in January 2001.

5.1.1.7 Summary of Issues and Concerns

A summary of issues and concerns identified throughout consultation activities is provided in Table 5-1. Issues and concerns were documented in the Application submitted to the NEB (Westcoast 2001a) and as a result of further consultation. Table 5-1 also indicates where issues and concerns identified are addressed in the CSR to present a clear picture of the relationship between issues and concerns raised and the how they contribute to the assessment process. Where possible, issues and concerns have been attributed to stakeholders consulted.

Table 5-1
Summary of Stakeholder Issues and Concerns Raised During Consultation

Stakeholder	Issue Raised	Where Addressed in Comprehensive Study Report
Labour and Economy		
Town of Chetwynd, Town of Tumbler Ridge	• desire that construction camps be located in Municipalities • business/local opportunities • construction schedule • future plans	2.1.6; 12.1
Town of Chetwynd, Town of Dawson Creek	• maximizing local opportunity	11.1, 12.1, 13.1

Stakeholder	**Issue Raised**	**Where Addressed in Comprehensive Study Report**
First Nation Communities (in general)	• project scheduling • business registration and Westcoast criteria • competitive bid process • contract definitions (e.g., clearing and grubbing) • prime contractor relationship	13.1.4.2.1
HFN, KLFN, SFN, WMFN, MLIB	• skill requirements to take advantage of opportunities	13.1.4.2.1
HFN, KLFN, SFN, WMFN, MLIB	• hiring practices in relation to key contractors	13.1.4.2.1
SFN, MLIB, HFN	• opportunities for Aboriginal employment	11.1
HFN, KLFN, SFN, WMFN, MLIB	• opportunities for Aboriginal companies or joint venture Aboriginal companies to bid and win contracts with prime contractor	11.1
HFN, KLFN, SFN	• opportunities for First Nations elders or designates to be environmental monitors during construction activities	11.1
HFN, KLFN, SFN, KLCN, WMFN, MLIB	• opportunities for First Nations elders or designates to walk the proposed pipeline route prior to construction	11.1
Aboriginal Issues	•	
Treaty 8 Tribal Association	• cumulative environmental effects • economic development • mitigation/rehabilitation/restoration • traditional knowledge	11.1, 13.1.4.2.1, 15.1
KLFN	• potential disturbance of traditional sites at proposed Wapiti River crossing	5.1.1.4, 7.1, 11.1, Historical Resource Protection Measures (EPP)
KLFN, Treaty 8 Tribal Association	• traditional land use in vicinity of proposed pipeline alignment	5.1.2.4, 11.1
HFN	• availability of berries and game for traditional use	5.1.1.4, 9.1, 11.1
KLFN, KLCN, SFN, WMFN, Treaty 8 Tribal Association	• inclusion of First Nations elders or designates while conducting a traditional land use study	5.1.1.4, 11.1
Community Services and Infrastructure		
AENV	• route to be used to remove salvaged wood in Alberta	10.1.1.1, 10.1.4.2.1
MOF	• road safety for all industrial users using access roads in the vicinity of the Project	2.1.10.3.1, 14.1.4.2.1 Access Management Plan (EPP)
Chetwynd Forest Industries	• access on Red Deer Forest Service Road in BC - to be used for hauling harvested timber from 2 proposed cutblocks in the next 3-4 years	10.1.4.2.1, 15.1, Access Management Plan (EPP)
Weyerhaeuser	• implications of road building on forest harvesting activities in the vicinity of the Project • timber salvage plan	10.1.1.1, 10.1.4.2.1 Access Management Plan (EPP)
Chetwynd Forest Industries, Canfor, West Fraser Timber, Weyerhaeuser, Louisiana Pacific	• maintenance of public access and access to resources by used by other land users • transportation of construction materials • construction schedule and road use • single point of contact for the Project	10.1.4.2.1 Access Management Plan (EPP)

Stakeholder	Issue Raised	Where Addressed in Comprehensive Study Report
Land Use		
Guide outfitters, trappers	• interference with scheduled guide outfitter, trapper and hunter's operations and activities • adverse effect on business • construction timing in relation to hunting season • increased access • regional planning issues	2.1.10.3.1;10.1.4.2.1, Access Management Plan (EPP)
Recreational users	• limiting or deterring access onto or along the RoW	2.1.10.3.1; 2.1.6.1; 10.1.1; 10.1.4.2
MOF	• reduction in timber harvesting	10.1.1.1; 10.1.4.2.1
MOF, BCAL, MEM, AENV	• compatibility with local and regional planning initiatives • use of contiguous corridors to minimize disturbance of land base • RoW widths • creation of separate RoW corridors • coordination of access to resources	2.1.6.1, 2.1.10.3.1; 10.1.1; 10.1.4.2 Access Management Plan (EPP)
Environment		
Chetwynd Environmental Society, AENV, trappers, guide outfitters, MELP	• access management in undeveloped areas (e.g., Wapiti region between Two Lakes Road and Huguenot Road) • coordination of access among users • minimizing new disturbance and access • use of access controls (e.g., roll backs) during and after construction	2.1.10.3.1; 15.1.3.2; Access Management Plan (EPP)
AENV	• prefers winter construction schedule with respect to terrain disturbance in wet areas; however, concerned that winter construction may affect overwintering habitat for caribou • caribou habitat protection • effects on grizzly bear population • effect of increased access • grading plan, erosion and sediment control mitigation • site reclamation, reforestation and vegetation management • deviation from established corridor across Narraway River	9.1, 15.1, Access Management Plan, Caribou Protection Plan, Grading and Soil Handling, Cleanup and Revegetation, and Erosion Protection Measures (EPP)
DFO	• directional drilling the preferred crossing method for watercourses • contingency planning for watercourse crossings • isolation crossing of the Narraway backchannel outside of fish windows is not preferred, but if it is the only option, an Erosion and Sediment Control Plan will be important • no open cuts • supported spring surveys for Arctic Grayling	2.1.4.2.4, 2.1.6.1; 7.0 Fisheries Protection, Stream Crossing Report (EPP)
Weyerhaeuser	• caribou habitat management	9.1, Caribou Protection Plan

Stakeholders consulted:

BC Ministry of Forests (MOF); BC Parks; BC Assets and Lands (BCAL); BC Ministry of Transportation and Highways (MOTH); BC Environment; Oil and Gas Commission (OGC); Alberta Environment (AENV); Fisheries and Oceans Canada (DFO); Canadian Wildlife Service (CWS); Chetwynd Environmental Society; Peace River Regional District (PRRD); District of Chetwynd; District of Tumbler Ridge; District of Beaverlodge; County of Grande Prairie; District of Greenview; Tansi Friendship Centre (Chetwynd); West Fraser Timber; Canfor; Weyerhaeuser; Louisiana Pacific; guide outfitters; trappers; Treaty 8 Tribal Association; Horselake First Nation (HFN); Kelly Lake First Nation (KLFN); Kelly Lake Cree Nation (KLCN); McLeod Lake Indian Band (MLIB); Saulteau First Nation (SFN); West Moberly First Nation (WMFN); Aseniwuche Winewak First Nation of Canada (AWFN); Ministry of Energy and Mines (MEM)

5.1.1.8 Selection of Valued Environmental Components

Based on a consideration of the environmental setting, issues scoping, professional judgement, and as a result of the issues raised during public, stakeholder, regulatory, and Aboriginal consultation, the following have been selected as Valued Environmental Components (VECs) for assessment in the comprehensive study:

- Air Quality;
- Fish and Fish Habitat;
- Vegetation, as represented by:
  - Uncommon Site Series,
  - Wetlands
  - Old Growth Forest, and
  - Rare Plants and Rare Plant Communities;
- Grizzly Bear;
- Caribou;
- Marten·
- Black-throated Green Warbler;
- Land Use;
- Aboriginal Land Use and Archaeological Resources;
- Community Services and Infrastructure; and
- Labour and Economy.

5.1.1.8.1 Air Quality

Under normal construction and operating conditions, few substantive environmental effects on air quality are expected with respect to the proposed pipeline. However, in the event of a pipeline leak or rupture, H_2S and natural gas may escape from the pipeline, representing a health threat to humans and wildlife in the area. Although the likelihood of a rupture or leak that would result in substantial amounts of H_2S being released into the atmosphere is remote, the environmental effects of a potential malfunction have been considered and assessed. Therefore, air quality is considered as a VEC for the purposes of the assessment.

5.1.1.8.2 Fish and Fish Habitat

Due to fish management considerations of the Dawson Creek LRMP (1999) and legislative requirements to protect fish habitat, fish and fish habitat have been selected as a VEC for the environmental assessment of the proposed pipeline. Sport fish species, primarily salmonid species listed in Tables 3-1 and 3-2 are valued recreationally and specific management objectives for the Alberta Plateau Resource Management Zone are outlined in the Dawson Creek LRMP. Fish habitat protection is regulated under the Federal Fisheries Act, the Alberta Environmental Protection and Enhancement Act and by referral under Section 9 of the BC Water Act.

5.1.1.8.3 Vegetation

The regions within which the proposed pipeline will traverse, are typically moist and cold, and dominated by forests of spruce, aspen, Englemann spruce and lodgepole pine. There are two biogeoclimatic zones present within the alignment of the pipeline, Boreal White and Black Spruce

(BWBS) and Engelmann Spruce-Subalpine Fir (ESSF). The majority of the region in which the route will be located (77.4%) is within the BWBS biogeoclimatic zone. This zone occurs in lowland and montane areas, between the lowest elevations in the area, ranging to the rolling foothills and mid-slopes of the Rocky Mountains. The ESSF biogeoclimatic zone is found at the highest elevations in the area of the proposed pipeline route, representing 22.6% of the region. As well, rare plant communities have been identified in the vicinity of the proposed route.

Vegetation plays an important role in providing wildlife habitat in the vicinity of the pipeline, and in the biodiversity of northeastern British Columbia and northwestern Alberta. Given the extensiveness of the two biogeoclimatic zones in the Project area, the assessment of vegetation focuses on three aspects of vegetation as VECs:

- Uncommon Site Series;
- Old Growth Forests; and
- Rare Plants and Rare Plant Communities.

5.1.1.8.4 Wildlife

Among the many wildlife species that live in the area, four species have been identified as "key indicator species" in the Dawson Creek LRMP: Woodland Caribou; Grizzly Bear; Marten; and Black-throated Green Warbler. Species such as Caribou and Grizzly Bear are particularly vulnerable to cumulative land use pressures and stress from the presence of human activity. In addition, Caribou and Grizzly Bear have large seasonal habitat requirements. Therefore, they are considered good indicators of overall ecosystem health - if the habitat and health of caribou and grizzly bear are protected, additional species that also reside within their range will also be protected. Furthermore, Caribou, Grizzly Bear, and Black-throated Green Warbler are listed provincially, while Marten are considered an important furbearer species regionally. Also, the Black-throated Green Warbler is commonly used in forestry-related monitoring in British Columbia.

By selecting these key indicator species as individual VECs on which to focus the analysis, it is believed that the results of the environmental effects analysis, including a consideration of cumulative environmental effects, will be representative of the ecosystem in the vicinity of the Project.

5.1.1.8.5 Land Use

The proposed Project will potentially result in a range of land use related environmental effects. These effects involve change in user opportunity, renewable resource capacity, visual quality and access to resources. Given the importance of land use in the area, it is selected as a VEC due to the potential of land use conflict and interaction.

5.1.1.8.6 Aboriginal Land Use and Archaeological Resources

During discussions with Westcoast, local Aboriginal communities expressed interest in the economic benefits, employment and contracting opportunities associated with the Project and raised general concerns regarding the environmental effects of the Project on the current use of land for traditional purposes and archaeological resources (Table 5-1). While the Saulteau First Nation has declined to participate in ongoing Project discussions they did communicate their general concerns regarding their interest in the area.

On December 5, 2000, Landsong Heritage Consulting Ltd. (Landsong) conducted a Preliminary Field Reconnaissance (PFR) of the Project. The PFR consisted of a low-level helicopter over-flight, a site file search of previously recorded archaeological sites and a review of previous heritage resource assessments in the Project area. As a result of the PFR, pre-impact archaeological assessments and traditional land use assessments were recommended for both the British Columbia and Alberta portions of the Project.

As noted above, the Aboriginal communities in the vicinity of the proposed route have expressed interest in opportunities associated with the Project and could provide sources of skilled labour during the construction of the pipeline. This aspect of Aboriginal interest is addressed in the context of the Labour and Economy VEC (Section 5.1.1.8.8).

Given the potential Project-related effects on archaeological resources and the current use of land for traditional purposes, Aboriginal land use and archaeological resources was selected as a VEC for consideration in this assessment.

5.1.1.8.7 Community Services and Infrastructure

The proposed pipeline will require the use of services in nearby communities in both BC and Alberta and will use existing road infrastructure to access the proposed RoW route. Based on professional judgement, issues scoping, concerns and issues raised during consultation activities, community services and infrastructure is identified as a VEC in this CSR.

5.1.1.8.8 Labour and Economy

The proposed Project will benefit the local economies in northeastern BC and northwestern Alberta and will employ people from nearby communities, including Aboriginal communities, particularly during the construction phase. As a result of professional judgement, issues scoping, and concerns and issues raised during consultation activities, labour and economy is considered as a VEC in the comprehensive study report.

5.1.2 Past, Present and Future Projects or Activities for the Evaluation of Cumulative Environmental Effects

For the purpose of the analysis of the cumulative environmental effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out, other activities within the vicinity of the Project have been reviewed. Other projects that could potentially act in combination with the Project to cause cumulative environmental effects on the VECs identified for this environmental effects assessment include:

- Oil and gas exploration, well development and production, and associated infrastructure and activities;
- Forest resource harvesting and associated infrastructure and activities; and
- Mineral prospecting and exploration and associated infrastructure and activities.

A number of non-project activities have also been identified for some consideration in relation to certain VECs as applicable, including:

- Hunting (legal and illegal);
- Guiding and Outfitting;

- Trapping;
- Consumptive recreational activities;
- Non-consumptive recreational activities; and
- Current use of land by Aboriginal persons for traditional purposes.

It is important to recognize that oil and gas development like the Project and these other land uses are all currently regulated under current provincial policies. The current state of the Project environment, in conjunction with the analysis of previously recorded environmental and cultural data, establishes a baseline for the evaluation of the cumulative environmental effects within the Project area.

Projects or activities in the Project area with existing or potential environmental effects that could act cumulatively with residual Project-related environmental effects were identified within the spatial and temporal bounds of the assessment.

5.1.2.1 Past Projects

Past projects that have been identified for consideration of potential cumulative environmental effects include:

- *Oil and gas exploration (seismic activity)* - the Project area is traversed by seismic cut lines (Map 1). The density of existing lines is highest in the northern half of the Project area, in the Red Willow, Wapiti River, Red Deer Creek and lower Belcourt creek watersheds (~km 0 to 52 of the pipeline). The density decreases somewhat in the Huguenot, Narraway and Gunderson watersheds to the south and east. Older cat-cut lines generally range from 6 m to 8 m in width. More recent heli-portable seismic equipment, cut lines range from an approved maximum width of 0.5 m on receiving lines to 1.75 m on source lines. Cat-clearing is minimized whenever possible and often clearing is done by hand from helicopter landing sites, located at 1 km intervals along the line (John Bradley, pers. comm.). Seismic line clearings are left to revegetate naturally. The degree and speed of recovery on the lines is variable depending on the initial level of clearing and ground disturbance.

- *Oil and gas well development* - Information available for the catchment of the existing Grizzly Pipeline (a corridor ~50 km wide roughly centered on the pipeline) shows well development activity as early as the mid-1950s and surges of activity in the mid-seventies and late nineties to present. In the vicinity of the Project there are approximately 35 gas wells. Concentrations are north of the route near the Provincial border and at the southeast end, east of the Narraway River. Within the portion of the pipeline catchment area between Huguenot Creek and the Narraway River there are currently 3 suspended gas wells, all within 5 km of the route.

  There are approximately 120 abandoned or suspended well sites within the Project catchment area. There is one abandoned well in the Huguenot drainage, west of the creek and several abandoned wells in the Narraway drainage, east of the river (Lynn Becker, pers. comm.). Access roads for abandoned wells may be reclaimed (Larry London, OGC, pers. comm.); roads to suspended wells may be retained for future access.

- *Pipelines* - Existing pipeline RoWs are concentrated in the vicinity of the northwest and southeast terminuses of the proposed Grizzly Extension Pipeline. Westcoast operates an existing pipeline that runs parallel to the first 15 km of the proposed line in BC (northwest end of the proposed line). Two Westcoast lines tie in to this line; one (approximately 9 km in length) in the Redwillow valley, and one (approx. 15 km in length) which originates in the Wapiti valley upstream of the crossing for the proposed line and runs north to connect with terminus of the existing line, crossing the Dokken and Fearless creek drainages enroute. Canadian Natural Resources Limited (CNRL) operates four lines that tie in with the existing Westcoast system, Burlington Resources Canada Energy Ltd. operates one line which joins the terminus of the existing Grizzly mainline from the west, and BP Canada Energy Company operates approximately seven kilometres of pipeline from an Amoco Canada gas well at b-11-I/93-I-10 to a riser location on the Westcoast RGT system at b-36-I/93-I-10.

In Alberta, at the southeast end of the proposed Grizzly Extension Pipeline, Canadian Forest Oil operates a line (~20 km in length) which roughly parallels the Two Lake Road, east of the Narraway River and north of the proposed Grizzly extension. This line joins an Anderson Resources (now Devon Canada Corporation) pipeline that extends south and east beyond the terminus of the proposed Grizzly Project. The Grizzly Extension Pipeline would parallel the Anderson pipeline for the final 9.5 km of its route. A short (~2.5 km) Canadian Hunter pipeline joins the Anderson line in that section.

- *Forest Resource Harvesting* - In BC, timber harvest activities in the Project area include the BC Ministry of Forests Small Business Forest Enterprise Program (SBFEP), and operations by West Fraser Timber's Chetwynd Forest Industries Limited (CFI). The SBFEP activity is concentrated between Red Deer and Belcourt Creeks. Past activity has clustered around existing access roads east of Red Deer Creek and in the lower Holtslander Creek drainage, south of the proposed line. A large portion of previously harvested land has been replanted and trees are now over 3 m high. Past activity has occurred in the Fearless and Kinuseo creek drainages, nearer the north end of the route. Some replanting has occurred with trees under 3 m. There has also been SBFEP activity east of the route in the Redwillow River drainage. All harvested sites in this area have been replanted (Dawson Creek Forest District, Forest Development Plans 2001-2005, Maps 16, 17, and 18).

CFI operates in the Flatbed Creek, Redwillow River, Wapiti and Red Deer Creek drainages (West Fraser Mills Ltd. Forest Development Plans 2002-2006) in the vicinity of the Project. There have been only a few cutblocks in the Flatbed Creek area and these are greened up. There is considerably more activity in the Redwillow River basin and again many of the older, previously cut areas have greened up. In the Red Deer Creek basin CFI is active in the Whatley Creek. Over half of the existing cutblocks in this valley have greened up. In the Wapiti drainage, there are two recent large cutblocks in the upper Becker Creek. Downstream of the Becker Creek confluence there are two previous, greened up cutblocks off an existing Forest Service Road on the east side of the Wapiti River valley and a smaller greened up area in a tributary valley, adjacent to the existing main Red Deer River Forest Service Road. There are also greened up blocks in the upper Fearless Creek drainage.

On the Alberta side, the route traverses Forestry Management Unit G3(P), which is managed through the East Peace Forest District Office. Weyerhaeuser is the only operator in the Alberta portion of the Project area. Maps of existing cutblocks are not currently available, but generally Weyerhaeuser operations are located to the north (Boundary Lakes area) and east (east of the Narraway River, along the Two Lakes Road) of the proposed route.

- *Mining* - There are several important coal deposits in the vicinity of the proposed route. Exploration was most active the 1970s and early 1980s, but since that time many of the coal leases have lapsed. However, in the last two years several small companies have acquired some of the key former leases and have re-evaluated their potential. A recent improvement in coking and thermal coal markets has lead to an increase in coal exploration in the province. There are two tenured coal prospects located within 5 km to the west of the pipeline route:

  - Monkman (MINFILE 0931013) - The property is comprised of 30 coal leases owned by Fording Ltd. and Sumisho Coal which extend into the upper Dokken and Fearless Creek basins. No recent work has been conducted on these leases; and

  - Belcourt (MINFILE: 0931014) - In the late 1970s, the Belcourt coal property, covered a 25 km long by 2.5 km band of propective coal geology that extended from the Red Deer River southeastward to the head waters of Huguenot Creek. Exploration outlined reserves of close to 114 million tonnes of metallurgical coal. There are currently two blocks of leases, owned by Western Coal Corporation, within that band, a block of three leases on the east side of Red Deer Creek extending into the headwaters of Holtslander Creek, and a block of 4 leases in upper Triad Creek. Test drilling has been carried out on the Holtslander block in the past few years (Bob Lane, MEM, pers. comm.).

5.1.2.2 Ongoing and Foreseeable Future Projects

The following discuss ongoing or foreseeable future projects:

- *Oil and gas exploration* - In BC there is one active application for seismic exploration in Wapiti Drainage, east of the pipeline at approximately KP 20 (Larry London, OGC, pers.com). In Alberta heli-portable, 3D seismic exploration is currently underway north of the proposed pipeline route between the Two Lakes Road and the BC/Alberta border (John Bradley, pers. comm).

- *Oil and gas well development* - approximately 30 gas wells are currently planned in the Project catchment area. Sixteen of these are east of the Narraway River and of these, ten are east of the pipelines eastern terminus. Ten are north of the route and west of the Narraway, in the lower Wapiti and Red Deer drainages, the Mistanusk and Chinook Creek drainages (between Red Deer Creek and the Narraway River), and in the Red Willow River drainage. Only three planned well sites are south of the route; one immediately west of Huguenot Creek about 2 km from the pipeline route, one between Little Prairie Creek and the Wapiti River within 6 km of the route and one in the Flatbed Creek drainage. In the area between the Narraway River and Huguenot Creek there are currently no applications for well development. However, a number of companies have acquired interests in lands to the north and south of the route (John Bradley, pers. comm.).

- *Pipelines* - There are no known applications for pipelines other than proposed Project. The construction of the Project will likely lead to short pipelines to tie-in gas wells.

- *Forest resource harvesting* - The SBFEP in BC has approved plans to harvest in the upper Holtslander drainage and proposed areas across the divide in a lower tributary of Belcourt Creek.

There are approved plans for harvest adjacent to existing harvested areas east of the Red Deer, upstream of Little Prairie Creek. There are also approved plans to harvest in the vicinity of the proposed main pipeline route and Weejay Lateral (~KP 42 - 51). A very small area has been approved for harvest in the Kinuseo drainage, west of the north end of the route. Approved plans are also in place for harvesting to the east in the Redwillow drainage, east of South Redwillow River. (Dawson Creek Forest District, Forest Development Plans 2001-2005, Maps 16, 17, and 18).

The CFI Dawson Creek 2002-2006 Forest Development Plan has two approved cutblocks in the Flatbed Creek area, not far off the Heritage Highway. There is also a small cutblock in the Kinuseo Creek drainage, adjacent to an existing access road. A number of approved cutblocks are indicated in the Redwillow River drainage; one near Stoney Lake, and the rest adjacent to previous cutblocks to the east. Improvements and extensions to existing access are required to develop this area. Two cutblocks are approved for the upper Whatley Creek drainage in the Red Deer Creek basin, and one for upper Becker Creek in the Wapiti drainage. Development of these areas will require extension of existing access roads. Downstream of the Becker Creek confluence, there is an approved cutblock adjacent to previous greened up cutblocks on the east side of the Wapiti Valley and two approved and two proposed cutblocks immediately opposite, on the west side of the valley. Development of all these blocks will require access road upgrades and extension. Further downstream, there are approved cutblocks in the vicinity of a previous cutblock off the Red Deer Forest Service Road. Upgrading and extension of existing access will be required to harvest these areas. Further east on the Red Deer Road, three approved and two proposed cutblocks are located in the immediate vicinity of the pipeline route at approximately KP 31-32. They are adjacent to existing roads and very little extension of access is required.

In Alberta, Weyerhaeuser's Access Plan for the Narraway area (dated December 4, 2001) indicates cutblock plans to the year 2005. West of the Narraway, cutblocks for 2001/2002 are located in the Boundary Lakes area in the vicinity of existing access (refer to Map 1). A block for 2002/2003 is shown southeast of Boundary lakes and north of Sherman Creek, adjacent to the existing access road to Boundary Lakes area. Proposed road corridors for the long term run south from these areas and west of Sulphur Creek, all the way to Goat Creek, and intercepting the proposed pipeline route. Weyerhaeuser has no plans to develop this corridor or harvest timber in this area for the next five to ten years (Luigi Morgantini, pers. comm.). Blocks to be harvested in the five year period to 2005 are located immediately east of Two Lakes road, between the Boundary Lakes access junction and the Bowen Road intersection (shown as LOC 760408 on Map 1), and west of Two Lakes road, along existing access to the south of the Bowen Road intersection.

- *Mining* - While some feasibility work has recently been carried out on the Belcourt claim area, there are currently no applications for development (D. Fawcett, pers. comm.). There is considerable interest in coal bed methane (CBM) potential in this area. Several blocks of gas rights that have experimental status with the British Columbia Oil and Gas Commission parallel the pipeline route to the west. To date seven CBM well locations have been licensed and four of those drilled. These wells are being tested and technical assessments are underway. If economic reserves can be delineated it would take several more years to see staged development (Derek Brown, Ministry of Energy and Mines, pers. comm.)

- *Open Camps* - An open camp to support proposed future projects is planned for an area near the Red Deer Creek airstrip (Section 12.1.4.2).

5.1.3 Project Environmental Effects Identification

5.1.3.1 Project Activities and Potential Environmental Effects

Potential environmental effects that are considered in this CSR may result from the interaction of Project activities and VECs. Each VEC chapter in this CSR includes environmental effects assessment matrices that identify potential environmental effects resulting from interactions with Project activities.

Project activities identified in each VEC chapter are defined in Table 5-2. Each Project activity identified in each VEC chapter is a category of Project activity, and represents a number of sub-activities. For example, RoW preparation involves clearing, grubbing, and stripping of the RoW, and stockpiling of topsoil, and related activities.

Potential environmental effects that can result from Project activity interactions with various VECs are identified and defined in Table 5-3. Potential environmental effects are broadly categorized under general headings in each VEC chapter, but are more specifically defined in Table 5-3. For example, a change in user opportunity for existing land uses can result in a change in recreational opportunities, a change in forestry harvesting patterns, a change in energy resource exploration and development, a change in hunting, guide outfitting or trapping activities, or a change in existing access.

While potential environmental effects are typically predicted using professional judgement and experience, these predictions also reflect the concerns and issues raised by public, regulatory, and Aboriginal stakeholders during consultation activities. Table 5-3 reflects the consideration of issues and the professional judgement of the study team.

5.1.4 Cumulative Environmental Assessment Triggers

In this section the CEA triggers (Section 4.1.2, Step 6) are identified for the cumulative environmental effects analysis. This exercise involves addressing the three questions identified in Hegmann, *et al.* (in press) and in the Cumulative Effects Assessment Practitioner's Guide (CEAA 1999):

1. Are other land use activities in the Project area having similar effects on the resource in question;
2. Do direct Project effects have the potential to overlap with or incrementally add to those of other land use activities in a meaningful fashion; and
3. Will Project contributions to regional cumulative environmental effects have the potential to measurably change the health or sustainability of the resource in question?

The following sections discuss the existence of CEA triggers for each VEC.

Table 5-2
Project Activities

Category of Project Activity	Sub-Activities and/or Description
Construction and Commissioning	
Access development	- construction of access roads - installation of access controls
RoW preparation	- clearing - grubbing - stripping - stockpiling of topsoil
Transportation of materials, personnel, and equipment	- transport of workers, materials, and equipment to and from construction spread
Pipeline installation	- Trenching - pipe installation - backfilling
Clean-up	- reclamation and revegetation
Testing	- Inspection - pipeline testing
Watercourse crossings	- installation of pipeline across watercourse either by directional drill or by isolation method
Operation	
Operation	- vegetation control - pigging/pipe cleaning - inspection - induced access
Decommissioning and Abandonment	
Decommissioning and Abandonment	- decommissioning (pipe purged, sealed) - abandonment (pipe purged, sealed, removed from ground) - RoW reclamation
Accidents, Malfunctions, and Unplanned Events	
Pipeline rupture/leak	- minor or major failure of pipeline infrastructure
Vehicle collision	- accidental collision involving worker vehicle(s) and/or wildlife
Forest/brush fire	- anthropogenically induced forest or brush fire
Public access	- unplanned/uncontrolled public access into Project area as a result of new RoW
Public accident	- accident involving a member of the public
Spill or accidental release of hazardous materials	- spill or accidental release of a material that is harmful to humans, wildlife, vegetation, or any other component of the environment
Loss of containment during watercourse crossings	- minor or major failure of containment structures during watercourse crossing installation
Construction worker accident	- accident involving a construction worker employed by Westcoast or pipeline contractor

Table 5-3
Potential Environmental Effects

Category of Environmental Effect	Description of Environmental Effect
Air Quality	
Change in air quality	• discernable change in quality of the regional air shed as a result of Project related emissions
Personal injury or loss of life	• could result from an accidental release of toxic emissions (i.e., during pipeline rupture or leak)
Fish and Fish Habitat	
Change in habitat	• habitat alteration, destruction, damage, or improvement
Change in habitat use	• change in habitat use as a result of habitat alteration, destruction, damage or improvement
Habitat fragmentation	• core habitat divided or fragmented by linear developments (e.g., pipeline, transmission lines, access roads), resulting in islands of sub-optimal habitat
Direct mortality	• direct mortality of fish species as a result of any phase of the Project
Vegetation	
Direct mortality	• direct mortality of plant species and/or communities as a result of any phase of the Project
Change in biodiversity	• change in the diversity and abundance of plant species or the structure of plant communities
Grizzly Bear Habitat	
Reduction in habitat availability	• reduction in availability habitat for any life phase • measurement of habitat suitability after habitat loss from Project activities and disturbances are considered • can result directly from permanent alteration of core habitat, or indirectly from sensory disturbance, which can render a zone of habitat area around the disturbance unavailable
Increase in high road density class	• increased number of roads within core security habitat
Reduction in core security habitat	• reduction of the minimal size of area that is required by a grizzly bear to survive
Direct mortality	• direct mortality of grizzly bears as a result of any phase of the Project
Caribou Habitat	
Reduction in habitat availability	• reduction in availability of critical habitat for any life phase • measurement of habitat suitability after habitat loss from Project activities and disturbances are considered • can result directly from permanent alteration of core habitat, or indirectly from sensory disturbance, which can render a zone of habitat area around the disturbance unavailable
Increase in high road density class	• increased number of roads throughout core security habitat
Reduction in core security habitat	• reduction of the minimal size of area that is required by a caribou or a caribou herd to survive
Direct mortality	• direct mortality of caribou as a result of any phase of the Project

Category of Environmental Effect	Description of Environmental Effect
Marten Habitat	
Reduction in habitat availability	- reduction in availability of critical habitat for any life phase - measurement of habitat suitability after habitat loss from Project activities and disturbances are considered - can result directly from permanent alteration of core habitat, or indirectly from sensory disturbance, which can render a zone of habitat area around the disturbance unavailable
Direct mortality	- direct mortality of marten as a result of any phase of the Project
Black-throated Green Warbler Habitat	
Reduction in habitat availability	- reduction in availability of critical habitat for any life phase - measurement of habitat suitability after habitat loss from Project activities and disturbances are considered - can result directly from permanent alteration of core habitat, or indirectly from sensory disturbance, which can render a zone of habitat area around the disturbance unavailable
Direct mortality	- direct mortality of Black-throated Green Warbler as a result of any phase of the Project
Land Use	
Change in user opportunity	- change in recreational opportunities, change in forestry harvesting patterns - change in energy resource exploration and development activities - change in hunting, guide outfitting, or trapping activities - change in access
Change in renewable resource capacity	- change in the amount of merchantable timber that can be harvested for sale
Change in visual quality	- change in the visual appearance or value of the landscape
Change in access to resources	- increased or decreased access to resources relevant to hunters, trappers, guide outfitters, recreational users, energy resource developers, mining and forestry companies
Aboriginal Land Use and Archaeological Resources	
Change in current use of land and resources for traditional purposes	- interference with traditional land uses as a result of Project related activities - traditional land uses precluded by Project related activities
Loss of heritage and cultural resources	- in areas of high heritage and/or cultural resource potential, the permanent loss of or damage to a heritage or cultural resource
Community Services and Infrastructure	
Change in the quality or use of infrastructure	- refers to potential environmental effects on transportation infrastructure and motor vehicle safety
Change in the quality of community services	- refers to potential environmental effects on accommodation, food services, medical, police, fire, and emergency services
Labour and Economy	
Change in employment	- increase or decrease of unemployment rate
Change in business revenue	- increase or decrease in revenue accrued by business in nearby communities or urban centres

5.1.4.1 Air Quality

Although there are some emissions associated with the Project that would overlap with those of other projects, the proposed pipeline does not include compressor or any other substantive emission releases that could reasonably be expected to lead to substantive cumulative environmental effects. Potential accidental releases of sour gas are extremely unlikely and would not overlap with other similar events or releases of sour gas. As such, overall there is no CEA trigger for air quality.

5.1.4.2 Fish and Fish Habitat

Potential cumulative environmental effects on fisheries habitat may arise from direct environmental effects of the Project as caused by construction activities combined with ongoing and overlapping erosion-related environmental effects from forestry, oil and gas development and other activities. Where these environmental effects occur within the same watershed there may be resulting adverse cumulative environmental effects on both fish and fish habitat.

In considering potential Project-related environmental effects on fish and fish habitat, the degree to which these environmental effects will contribute to regional or watershed based cumulative pressures will be largely dependent on the construction and mitigation plans proposed for the Project. In order to effectively anticipate and mitigate potential adverse environmental effects for this project, a detailed Stream Crossing Report (EPP - Appendix 2) has been prepared. Stringent fisheries protection measures have been developed with the intent to achieve a no net loss of fish or fish habitat. For example, the fish bearing watercourse crossings are being conducted using trenchless installation techniques (directional drill or span aerial) for all but the three smaller streams. For these smaller streams, habitat alteration and fish moralities are predicted to be eliminated or greatly reduced through appropriate isolation techniques, compliance with in-stream work windows and best available practices. Similarly, appropriate route selection, temporary run-off controls and reclamation initiatives are expected to largely prevent sediment introductions from ROW approach slopes both during and after construction.

A detailed Access Management Plan has been developed (refer to EPP - Appendix 3) for areas affected by the Project. The objective of the Plan is to minimize recreational access, which will, as a result, minimize related environmental effects on fish and fish habitat. Access control measures, monitoring and adaptive management will be applied to achieve that objective. Westcoast will also proactively engage in coordinated access planning and management with other stakeholders in the area with the intent of preserving the effectiveness of the Access Management Plan and improving standards in the area overall. In light of mitigation and design considerations, it is determined that the residual environmental effects for the Project will not persist, will not result in a net loss to fish and fish habitat and, therefore, are not predicted to contribute towards cumulative pressures on the resource. In consideration of this lack of residual adverse environmental effects of the Project on fish and fish habitat, this VEC is not considered further in the context of regional cumulative environmental effects.

5.1.4.3 Vegetation

Environmental effects on vegetation communities are an indicative measure of probable changes in regional terrestrial biodiversity. Such an assessment evaluates the extent of existing disturbance by identifying underrepresented communities within the study area, and the significance of incremental disturbance from the pipeline in the context of predevelopment and existing disturbed scenarios. In this process, assessment of project-related environmental effects on vegetation and related biota are based on the distribution and abundance of communities along the entire length of the pipeline. Analysis of cumulative environmental effects have been a consideration for several of the vegetation VECs (uncommon site series, old growth, and wetlands) that are considered to be underrepresented in areas surrounding the pipeline. The process includes calculation of total project-related clearing and disturbance (ha) for each community, and calculation of total community availability in the study area (as a percentage) to indicate relative significance of disturbance. As such, vegetation communities are considered to be CEA triggers for the purpose of this assessment.

Cumulative environmental effects on rare plants in the region are difficult to determine, given the lack of quantitative data on the number and size of occurrences of each species of rare plant in the region or the effects of other activities on rare plants. Databases for these resources in both Alberta and BC are patchy and preliminary. In addition, for practical reasons, rare plant surveys were only conducted on the Project footprint and sensitive wetlands adjacent to the RoW, and not in the entire LSA. Therefore there is no reliable information on regional distributions of rare plants in the Project area. For these reasons, rare plants are not considered for cumulative environmental effects assessment.

5.1.4.4 Wildlife

The Project will result in environmental effects on wildlife that overlap with those of other projects and thus wildlife is a CEA trigger. Of the 246 wildlife species expected or known to occur in the region (see Appendix J in EIA, AXYS 2001a), a subset of 19 species was chosen for closer examination and discussion (AXYS 2001a). These species were identified to be of management concern based on their status federally (i.e., endangered, threatened, or vulnerable; COSEWIC 2000), provincially (red or blue listed; AENV 2000, BC CDC), or regionally (Dawson Creek LRMP 1999). Of the 19 species, four were selected as valued ecosystem components (VECs) for detailed quantitative analyses (i.e., woodland caribou, grizzly bear, marten, and black-throated green warbler). All four species have been identified as "key indicator species" in the area (Dawson Creek LRMP 1999). Furthermore, three of the species (i.e., caribou, grizzly bear, and black-throated green warbler) are listed provincially, while marten is considered an important furbearer species regionally.

For an analysis of cumulative environmental effects, it was considered important to select species that are particularly vulnerable to cumulative land use pressures. Grizzly bear and caribou were selected for cumulative environmental effects analyses for the following reasons:

- both are landscape species that require large seasonal territories or ranges and, hence, have the potential to interact with multiple land use activities at the individual animal and population level;
- both species are dependent on relatively specific and often restricted habitat types for portions of the year; and
- both species are particularly vulnerable to access availability and reductions in secure habitat.

Marten and black-throated green warbler were selected for cumulative environmental effects analyses for the following reasons:

- both species are susceptible to loss of forest cover (e.g., through forest harvesting); and
- both species are likely vulnerable to habitat fragmentation (i.e., edge effects) and the resulting decrease in habitat effectiveness.

By selecting these four species, it is believed that the results of a cumulative environmental effects analysis would represent a worst-case scenario for environmental assessment purposes.

5.1.4.5 Land Use

The proposed Project will result in a number of land use related changes, including: changes in user opportunity; changes in renewable resource capacity; changes in visual quality; and changes in access to resources. To mitigate these potential Project-related environmental effects, a wide-range of mitigation has been proposed, including for example, access management, coordination with other users, timber salvage, RoW design, environmental protection and emergency response. Many of the proposed measures will be highly effective. However, in a multi-resource use context the presence of the Project itself and/or implementation of access management measures may inherently conflict with on or more other land uses in the area. Some uses benefit from increased access while others do not. Accordingly, the issue of access management and land use is considered to be a CEA trigger and is carried through to the cumulative environmental effects assessment. This analysis is addressed in the context of other cumulative environmental effects arising from access related issues (e.g., vegetation, grizzly bear, caribou, traditional land use) in Section 15.0.

5.1.4.6 Aboriginal Land Use and Archaeological Resources

Westcoast, Landsong, West Moberly First Nations, Kelly Lake First Nations, Kelly Lake Cree Nations, McLeod Lake Indian Band, Horse Lake First Nations, and Aseniwuche Winewak Nation have worked together since the initial stages of Project planning. This will ensure the integrity of the identification, recording, and reporting on traditional land use and archaeological information. Through the willingness of Aboriginal participants to share their traditional knowledge of the Project area and its resources with Landsong, viable options for the mitigation of sites have been forthcoming. Westcoast is committed to the TUAS process and the protection of traditional land use sites and resources. As a result of the TUAS and the ongoing discussion with participating communities, plans for traditional land use site avoidance through RoW routing diversions, Project environmental design, flagging and monitoring of sites, and the implementation of access controls and the Access Management Plan have been put into place.

Whereas site-specific environmental effects on traditional land use sites are managed, access management of the Project in combination with access-related environmental effects of other projects and activities in the area could have a bearing on activities and the resource base associated with traditional use. Accordingly, the environmental effects of access on the current use of lands and resources for traditional purposes is considered a CEA trigger and is carried through to the cumulative environmental effects summary (Section 15.0) where it is addressed in the context of cumulative environmental effects arising from access-related issues (e.g., vegetation, wildlife, and non-Aboriginal land use).

5.1.4.7 Community Services and Infrastructure

The Project will result in some adverse environmental effects (Section 12.0). These include the two principal environmental effects: changes in the quality or use of infrastructure; and changes in the quality of community services. Although it is acknowledged that these environmental effects would overlap with those of other projects, the magnitude of these and those of other projects are such that no substantive cumulative environmental effects could reasonably be expected to arise on community services and infrastructure. It is therefore concluded that there is no CEA trigger.

5.1.4.8 Labour and Economy

The Project will result in both a change in employment and a change in business revenue. However, as noted in Section 13.0, these environmental effects are mostly positive with the exception of some potential accidents, malfunctions and unplanned events. The environmental effects that might be considered to be potentially adverse are unlikely and with mitigation, are not expected to contribute to unacceptable cumulative environmental effects. Hence it is concluded that there are no CEA triggers.

5.2 Additional Submissions

There are no additional submissions related to Chapter 5.

5.3 Conclusions

Westcoast has not applied to amend the scope of its application and no party has identified any issues that can not be addressed within the scope set out in Appendix A. Accordingly, no need to modify the scope has been identified.

Chapter 6

Air Quality

6.1 Westcoast Submission - Revised Draft CSR - 4 January 2002

6.1.1 Existing Conditions

The proposed pipeline is located in the Rocky Mountain Foothills. The climate of the area has been characterized as continental with long cold winters and short cool summers (Levelton 1994). Occasional intrusions or warm maritime air from the western side of the Rocky Mountains can greatly influence the local climate. During the winter months, such intrusions can result in "Chinook" conditions which are characterized by rapid temperature increases as warm Pacific air subsides down the eastern face of the Rockies.

The ambient temperatures are strongly influenced by local elevation and by the interaction of the mountains with the cold continental and warm maritime air masses. Mean daily temperature at nearby Tumbler Ridge ranges from –17.5°C in February to 15.1°C in August (B.H. Levelton and Associates Ltd. 1994).

Local precipitation and evaporation can vary significantly from year to year depending on the interaction of continental and maritime air masses. In addition, the mountainous terrain in the vicinity of the proposed pipeline can set up isolated pockets where precipitation varies from the values representative of the entire region. The average annual precipitation at Tumbler Ridge is slightly over 490 mm, with rain accounting for a little under 60 % of the total (B.H. Levelton and Associates Ltd. 1994).

Due to the complex terrain in the vicinity of the proposed pipeline the surface roughness and terrain features have considerable influence on the winds. At higher elevations, the winds are influenced less by the surface and reflect the regional flow patterns. There are no data available for the vicinity of the pipeline. Jacques Whitford (2001) noted that winds at Tumbler Ridge tend to be predominantly from the southwest; however the route of the Grizzly Extension Pipeline tends to follow creek valleys that have a northwest-southeast orientation. Winds will tend to channel along these creek valleys and therefore the Tumbler Ridge winds were rotated for the air quality analyses about 90 degrees anticlockwise to reflect the surrounding topography and expected predominant wind direction.

6.1.2 Boundaries

6.1.2.1 Spatial Boundaries

Although the Project does involve the release of very small quantities of greenhouse gases (Section 2.1.7.3), it is concluded that these are inconsequential in relation to regional, provincial or national emissions. Therefore, the environmental assessment is focussed on spatial boundaries associated with the local airshed (*i.e.*, where Project-related environmental effects may be observed). The local airshed is the area potentially affected by air emissions from a source. Based on the worst case scenario for potential air emissions from the Project, the spatial boundary or "assessment area" for the air is assumed to be a 16 km buffer along the pipeline routes. This distance is based on a consequence assessment (Jacques Whitford 2001) that indicates the maximum distances to H_2S concentrations equal to 100 ppm predicted for a three-minute period as a result of a worst-case guillotine rupture of the pipeline. A guillotine rupture is a pipeline failure that occurs when a pipeline segment is severed in two, and gas escapes from the full cross-sectional area of both resulting pipeline segments. This endpoint was chosen because emergency planning zones around fixed facilities are based on minimum expected distance to an H_2S concentration equal to 100 ppm and because severe health effects, which may lead to death, become more likely as concentration increases above 150 ppm and as exposure time increases. The relatively short three-minute averaging period was chosen because predicted concentrations decrease with increasing averaging period because short-term concentration fluctuations have less influence over a longer period. Therefore the downwind extent to 100 ppm H_2S will be greater and hence worst case for a shorter averaging period. The shortest averaging period for which the GASCON2 model (which is used in the environmental effects analysis later) is valid is three minutes and so predictions are reported for this period.

6.1.2.2 Temporal Boundaries

Environmental effects of Project-related activities on air quality can occur during construction and commissioning, operation, and decommissioning and abandonment. As well, environmental effects on air quality can occur as a result of malfunctions, accidents, and unplanned events.

Construction and commissioning of the proposed pipeline are anticipated to occur from July 2002 through early 2003. Decommissioning and abandonment have been considered as possible future events after the 40-year minimum life of the Project. Malfunctions, accidents, and unplanned events, can occur at any time during the life of the proposed pipeline.

6.1.3 Project Rating Criteria

A *significant residual environmental effect* on air quality is one that degrades the quality of the air such that the maximum acceptable level (as specified by applicable provincial regulations and standards) within the assessment area is exceeded on an annual basis. For 24-hour or hourly standards, standards would be exceeded on a frequent basis (*i.e.*, >10 exceedances per year). In the case of an accident or malfunction, a *significant residual environmental effect* on air quality is one that would result in the loss of human life.

A *not significant residual environmental effect* on air quality is one that degrades the quality of the air such that the maximum acceptable level (as specified by applicable provincial regulations and standards) within the assessment area is not exceeded on an annual basis. For 24-hour and hourly standards, standards would not be exceeded on a frequent basis (*i.e.*, <10 exceedances per year) or at all. In the case of an accident or malfunction, a *not significant residual environmental effect* on air quality is one that could not result in the loss of human life.

The selected residual environmental effects criteria for air quality reflects a "knife-edge" threshold between significant and not significant because it relies primarily on regulatory standards that are of this nature. This approach is inherently conservative, despite appearances to the contrary, because standards are normally developed on a basis that ensures no substantive or unacceptable environmental or human health effects would result from emissions. Standards are set by regulatory authorities at levels that are often well below levels that air quality and/or health professionals believe might result in what one might consider to be significant or unacceptable environmental or human health effects. Hence, these thresholds for significance are not "knife-edges" of significance, but rather conservative estimates of where unacceptable environmental or human health effects might occur.

The threshold of significance for accidental events is difficult to set on the basis of risk as there is no accepted standard of what constitutes an acceptable level of risk for a sour gas pipeline. To that end, this criterion is simply set at a threshold where the loss of human life might occur.

6.1.4 Evaluation of Project-related Environmental Effects

6.1.4.1 Potential Interactions

Table 6-1 describes the potential interactions of the Project with air quality.

During clearing, although timber will be salvaged, brush, branches and tops of trees will be burned releasing the products of combustion including particularly carbon dioxide and particulate matter.

During construction, most activities will involve the burning of fuel and the release of the products of combustion (*e.g.*, carbon dioxide, sulphur oxides, nitrogen oxides, volatile organic compounds (VOCs), particulate matter) by Project vehicles and equipment. There may be dust associated with construction excavations and vehicle movement on unsurfaced roads (particulate matter). Pipe installation will result in the release of the by-products of welding. The use of hazardous materials, especially gasoline and diesel fuel, may release particularly VOCs.

Table 6-1
Potential Interaction of the Project with Air Quality

Project Activities and Physical Works	Potential Environmental Effects	
	Change in air quality	Personal injury or loss of life
Construction and Commissioning	✔	
Operation	✔	
Decommissioning and Abandonment	✔	
Accidents, Malfunctions and Unplanned Events		
Pipeline rupture/leak	✔	✔
Forest/bush fire	✔	
Spill or accidental release of hazardous materials	✔	

During operation, air emissions will be restricted primarily to the use of vehicles as described for construction. There may be minor releases of sour gas associated with maintenance and the potential for relief of overpressure conditions. Decommissioning and abandonment would result in similar emissions to those described for construction and operation as a result of pipeline purging.

Accidents, malfunctions and unplanned events may include pipeline leaks or ruptures and the release of sour gas. Forest fires would release the products of combustion, especially particulate matter. The loss of hazardous materials as a result of spills, most likely fuel, would result in the release of VOCs.

Although the release of greenhouse gases would occur in association with various Project activities (*e.g.*, pipeline releases and vehicle emissions), their contribution to regional, provincial or national emissions would be nominal and inconsequential, and hence are not considered further as they have little role in contributing to potential cumulative environmental effects on global climate.

6.1.4.2 Environmental Effects Analysis

6.1.4.2.1 Construction and Commissioning

During construction and commissioning, air quality may be affected as a result of the creation of dust, burning of wood and brush, and through vehicle emissions (Table 6-2). Dust control measures will be employed where necessary to reduce dust produced on access roads and the construction spreads (EPP Section 2(9)). Fuel usage and burning will be minimal and of short duration and are not expected to result in substantive issues because there is little habitation in the vicinity of the pipeline. Vehicle emissions will be transient and locally of short duration, and in areas where the potential for unacceptable level of vehicle emissions are likely to occur (*e.g.*, particulate matter, SO_2, NO_x, VOCs, CO, and PAHs). Any change in air quality during construction and commissioning will be localized and short term, and likely to be within applicable regulatory standards. Even dust, the anticipated parameter of likely greatest magnitude for construction, is expected to be mitigated to acceptable levels. Therefore, environmental effects on air quality during construction and commissioning are considered to be not

Table 6-2
Environmental Effects Assessment Matrix: Air Quality – Construction and Commissioning

<table>
<tr><th rowspan="2">Project Activity</th><th rowspan="2">Potential Positive (P) or Adverse (A) Environmental Effect</th><th rowspan="2">Mitigation</th><th colspan="5">Evaluation Criteria for Assessing Environmental Effects</th></tr>
<tr><th>Magnitude</th><th>Geographic Extent</th><th>Duration/ Frequency</th><th>Reversibility</th><th>Socio-Cultural Context</th></tr>
<tr><td>Construction and Commissioning</td><td>Change in air quality (A)</td><td>Dust control measures (EPP)</td><td>1</td><td>1-2</td><td>2/6</td><td>R</td><td>2</td></tr>
<tr><td colspan="2">KEY

Magnitude:
1 = Low: there is a measurable change in air quality, but where guidelines, objectives and/or legislation are not exceeded or accidental events may result in personal injury
2 = Medium: where air quality is degraded such that guidelines, objectives and/or legislation are exceeded occasionally or accidental events result in personal injury
3 = High: where air quality is degraded such that guidelines, objectives and/or legislation are exceeded on a frequent basis or an accidental event results in loss of life</td><td>Geographic Extent:
1 = <1 km^2
2 = 1-10 km^2
3 = 11-100 km^2
4 = 101-1000 km^2
5 = 1001-10,000 km^2
6 = >10,000 km^2

Duration:
1 = < 1 month
2 = 1-12 months
3 = 13-36 months
4 = 37-72 months
5 = > 72 months</td><td colspan="2">Frequency:
1 = < 11 events/year
2 = 11-50 events/year
3 = 51-100 events/year
4 = 101-200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible</td><td colspan="3">Ecological/Socio-Cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse effects.

N/A = Not Applicable</td></tr>
</table>

significant as these environmental effects are expected not to result in the exceedance of applicable air emission regulatory standards.

6.1.4.2.2 Operation and Maintenance

During operation and maintenance activities, air quality may be affected as a result of vehicle emissions (although these are very minor) and/or by the minor release of gas from the pipeline through release of over-pressure or pigging (Table 6-3). Gas release during pigging or pressure release will be controlled and conducted according to procedures set out in the Environmental, Health and Safety, Management System. The quantity of SO_2 released is considered nominal when compared to, for example, the releases from the gas processing plants to which the gas is destined for treatment. Once weekly, pigging barrels will be flared, controlling H_2S and methane releases. This is estimated to result in 16.0 tonnes CO_{2e} emissions weekly (Section 2.1.7.3). These emissions too are considered nominal as for example, the total emission of CO_2 alone in Alberta in 2000 was over 200 million tonnes (averaging over 3.8 million tonnes per week) (Natural Resources Canada 2001). Project emissions are of short duration and will be limited in geographic extent. Although the SO_2 release during flaring will result in localized, short-term environmental effects, these are not expected to result in exceedance of applicable regulations. The pigging procedures followed by Westcoast as described in Section 2.1.6.2.4 are necessary for the safe, long-term operation of the facility. The emissions are flared to minimize the amount of greenhouse gases and hydrogen sulphide that are emitted. As a result, carbon dioxide is released rather than methane. Methane has a much higher greenhouse gas effect than carbon dioxide (equivalency factor of 21) and thus this is beneficial in reducing the contribution to climate change that the Project may have, even

Table 6-3
Environmental Effects Assessment Matrix: Air Quality – Operation and Maintenance

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural Context
Operation	Change in air quality (A)	Flaring of pressure releas and pigging emissions	1	1	1/1	R	2

KEY

Magnitude:
1 = Low: there is a measurable change in air quality, but where guidelines, objectives and/or legislation are not exceeded or accidental events may result in personal injury
2 = Medium: where air quality is degraded such that guidelines, objectives and/or legislation are exceeded occasionally or accidental events result in personal injury
3 = High: where air quality is degraded such that guidelines, objectives and/or legislation are exceeded on a frequent basis or an accidental event results in loss of life

Geographic Extent:
1 = <1 km²
2 = 1-10 km²
3 = 11-100 km²
4 = 101-1000 km²
5 = 1001-10,000 km²
6 = >10,000 km²

Duration:
1 = < 1 month
2 = 1-12 months
3 = 13-36 months
4 = 37-72 months
5 = > 72 months

Frequency:
1 = < 11 events/year
2 = 11-50 events/year
3 = 51-100 events/year
4 = 101-200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-Cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse effects.

N/A = Not Applicable

though the Project overall is a nominal contributor to greenhouse gas emissions. Minor fugitive emissions at above ground facilities during operation due to very small leaks are expected to be small as compared with emissions during pigging.

As a consequence, the environmental effects of operation on air quality are considered to be not significant due to the minor contribution to provincial emissions and the application of mitigation to minimize these releases.

6.1.4.2.3 Decommissioning and Abandonment

During decommissioning and abandonment, air quality may be affected as a result of purging the pipeline of residual gas (Table 6-4). During purging, the gas would be flared and the associated emissions would be minimal and less than experienced during operation (Section 2.1.7). Any change in air quality during decommissioning and abandonment will be localized and short term and at levels that do not exceed guidelines, objectives or legislation. Therefore, environmental effects on air quality during decommissioning and abandonment are considered to be not significant.

6.1.4.2.4 Accidents, Malfunctions and Unplanned Events

Environmental effects on air quality that could occur as a result of malfunctions, accidents, or unplanned events include a change in air quality, and personal injury or loss of life (Table 6-5). Malfunctions, accidents, or unplanned events that are considered with respect to air quality include pipeline leak or rupture, forest/bush fire, and a spill or accidental release of a hazardous material.

Table 6-4
Environmental Effects Assessment Matrix: Air Quality – Decommissioning and Abandonment

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural Context
Decommissioning and abandonment	Change in air quality (A)	Flaring of purging emissions.	1	1	1/1	R	2
KEY Magnitude: 1 = Low: there is a measurable change in air quality, but where guidelines, objectives and/or legislation are not exceeded or accidental events may result in personal injury 2 = Medium: where air quality is degraded such that guidelines, objectives and/or legislation are exceeded occasionally or accidental events result in personal injury 3 = High: where air quality is degraded such that guidelines, objectives and/or legislation are exceeded on a frequent basis or an accidental event results in loss of life		Geographic Extent: 1 = <1 km^2 2 = 1-10 km^2 3 = 11-100 km^2 4 = 101-1000 km^2 5 = 1001-10,000 km^2 6 = >10,000 km^2 Duration: 1 = < 1 month 2 = 1-12 months 3 = 13-36 months 4 = 37-72 months 5 = > 72 months	Frequency: 1 = < 11 events/year 2 = 11-50 events/year 3 = 51-100 events/year 4 = 101-200 events/year 5 = >200 events/year 6 = continuous Reversibility: R = Reversible I = Irreversible		Ecological/Socio-Cultural and Economic Context: 1 = Relatively pristine area or area not adversely affected by human activity. 2 = Evidence of adverse effects. N/A = Not Applicable		

Table 6-5
Environmental Effects Assessment Matrix: Air Quality – Malfunctions, Accidents, and Unplanned Events

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural Context
Pipeline rupture/leak	Change in air quality (A)	ERP	1-3	1-3	1/1	R	2
	Personal injury or loss of life (A)	EPP; ERP	3	1-3	1/1	I	2
Forest/bush fire	Change in air quality (A)	EPP; ERP	1-3	1-3	1/1	R	2
Spill or accidental release of hazardous materials	Change in air quality (A)	EPP; ERP	1-3	1	1/1	R	2

KEY

Magnitude:
1 = Low: there is a measurable change in air quality, but where guidelines, objectives and/or legislation are not exceeded or accidental events may result in personal injury
2 = Medium: where air quality is degraded such that guidelines, objectives and/or legislation are exceeded occasionally or accidental events result in personal injury
3 = High: where air quality is degraded such that guidelines, objectives and/or legislation are exceeded on a frequent basis or an accidental event results in loss of life

Geographic Extent:
1 = <1 km²
2 = 1-10 km²
3 = 11-100 km²
4 = 101-1000 km²
5 = 1001-10,000 km²
6 = >10,000 km²

Duration:
1 = < 1 month
2 = 1-12 months
3 = 13-36 months
4 = 37-72 months
5 = > 72 months

Frequency:
1 = < 11 events/year
2 = 11-50 events/year
3 = 51-100 events/year
4 = 101-200 events/year
5 = >200 events/year
6 = continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological/Socio-Cultural and Economic Context:
1 = Relatively pristine area or area not adversely affected by human activity.
2 = Evidence of adverse effects.

N/A = Not Applicable
EPP = Environmental Protection Plan
ERP = Environmental Response Plan

Malfunctions, accidents, and unplanned events are difficult to predict, but when and if they occur, they will be short term in duration and localized, except perhaps in highly unlikely circumstances. The likelihood of an extensive forest fire or complete pipeline failure and rupture is very low given the safety features and practices employed during all phases of the Project (the ERP, which will be prepared prior to construction (Section 2.1.10.3.5), and the Fire Contingency Plan (EPP)). The pipeline is designed to meet applicable design standards intended to ensure acceptable levels of risk. The risk of a substantial spill of fuel or other hazardous material is low due to prevention measures prescribed in the EPP and the Spill Contingency Plan.

A consequence assessment of a potential pipeline leak or rupture was completed by Jacques Whitford (2001) (Section 2.1.9.3). Consequences due to exposure to H_2S as a result of an uncontrolled release of sour gas from a pipeline rupture were assessed for guillotine (complete rupture) and partial rupture scenarios, using the EUB GASCON2 model. The consequence assessment provides the basis for the assessment of potential environmental effects resulting from a pipeline leak or rupture.

The GASCON2 model simulates the detailed physical processes that occur during a sour gas pipeline rupture that result in a release of high-pressure gas to the atmosphere. The plume dispersion module of GASCON2 estimates time-averaged ground-level H_2S concentrations. An individual situated downwind of a sour gas release would be exposed to time-varying concentrations resulting from instantaneous fluctuations about the time-weighted average. Lethality of an exposure to H_2S is evaluated in terms of time-integrated toxic load, which accounts for concentration, exposure time and the log normal distribution of population susceptibility.

The GASCON2 model was applied to partial and guillotine ruptures. For each rupture configuration, estimates were obtained of maximum distance to three-minute average outdoor ground-level H_2S concentrations of 20 and 100 ppm and of the maximum distance to a 1% probability of lethality based on the event time for a given scenario. These endpoints were selected because 20 ppm is the ceiling occupational exposure limit; emergency planning zones tend to be based on the maximum distance to 100 ppm; and a 1% probability of lethality is a standard yet conservative measure of potential lethality.

Consequences due to exposure to H_2S as a result of an uncontrolled release of sour gas from a pipeline rupture were assessed for guillotine and partial ruptures using the Alberta Energy and Utilities Board GASCON2 model. Consequences were assessed for the four segments of the Grizzly Extension Pipeline under normal and maximum operating conditions. The expected H_2S content of the pipeline gas is 13%. Results for maximum distances to three-minute average ground-level H_2S concentrations of 20 and 100 ppm and to a 1% probability of lethality, were 64.8, 16.3 and 10.2 km, respectively, under worst case conditions. These distances were all predicted to occur as a result of a guillotine rupture of the longest segment (KP 43 to KP 95). These distances are associated with low wind speed (1.5 m s^{-1}) and moderately stable conditions, which occur 9.4% of the time. Predicted distances under other meteorological conditions and different rupture scenarios are less than 64.8, 16.3 and 10.2 km. Eighty-six percent (86%) of the time distances to 20 ppm, 100 ppm and a 1% probability of lethality for the worst case rupture scenario (guillotine rupture of the longest segment) are predicted to be less than 15, 4 and 2.5 km, respectively. Corresponding distances are even less for other rupture scenarios. Caution must be exercised when interpreting results for these worst-case conditions for distances greater than about 10 km due to limitations of the model.

The proposed pipeline will be designed in compliance with accepted design standards. As described in Section 2.1.5.2, these include CSA Z662-99, the provisions of the *National Energy Board Act*, and the *Onshore Pipeline Regulations – 1999*. These standards include design parameters that reflect the level of risk for human health and safety for sour gas pipelines. These criteria have been set in the interest of public health and safety and will be met by the Project. The Project does not occur in an area where there are permanent residences in close proximity to the proposed pipeline. The risk of an accident to human life is a reflection of a transient visitor (*e.g.*, recreationalist, forest worker) being sufficiently close to an accidental release to result in a human health or loss of life situation. The likelihood of this is extremely low. As noted, this unlikely situation is mitigated through design, inspection and the implementation of a rigorous Emergency Response Plan.

The Project specific ERP, which will be produced by Westcoast, will outline procedures for dealing with accidents, malfunctions, and unplanned events so that the likelihood of occurrence and the consequences are minimized. As applicable, the results of accidents, malfunctions, and unplanned events will be contained, controlled, and cleaned-up immediately (EPP Section 16). Importantly, Westcoast will design the pipeline to meet the requirements of applicable standards (Section 2.1.5.2) that are intended to ensure the level of risk to human health and safety is at an acceptable level. Based on the characteristics of the potential environmental effects and the implementation of applicable design standards, the Project will not result in unacceptable risks. Hence, the potential environmental effects of Project-related accidents, malfunctions, and unplanned events are rated not significant.

6.1.4.3 Determination of Significance

The significance of Project-related environmental effects are summarized in Table 6-6 for each phase and the Project overall. In all phases, the Project will not result in significant environmental effects. However, in the unlikely event of an accidental release of sour gas when a person or persons are within close proximity to the pipeline, the environmental effects could be severe. The likelihood of such accidental releases are extremely low in light of design standards and setbacks that are applied in the interest of safety. Hence, the environmental effects of the Project are rated not significant.

Table 6-6
Summary of Environmental Effects – Air Quality

Phase	Project Rating
Construction and Commissioning	NS
Operation	NS
Decommissioning and Abandonment	NS
Accidents, Malfunctions and Unplanned Events	NS
Project Overall	NS

Key:

Residual environmental Effect Rating:
S = Significant Adverse Environmental Effect
NS = Not-significant Adverse Environmental Effect
P = Positive Environmental Effect

6.1.5 Monitoring and Follow-Up

No scientific monitoring or follow-up is recommended. The level of risk of significant environmental effects is so low that monitoring is not warranted. There are no continuous emissions as there is no compression required. The only releases are small and result from pigging. These are effectively mitigated by procedures that minimize their magnitude and environmental effect. The technology (*e.g.*, pipe, valves, *etc.*) is proven and reliable. Westcoast will conduct regular inspections during the operation and maintenance phase of the Project to ensure the integrity of the pipeline and minimizing the probability of a pipeline failure. Westcoast will also have a comprehensive program to monitor for leaks and or ruptures.

6.2 Additional Submissions

6.2.1 Westcoast

Emissions

Westcoast stated that any fugitive emissions from the valves are expected to be extremely minor and its intention would be to reduce these to an absolute minimum. Westcoast stated that it would conduct quarterly physical inspections at the valve locations as part of its on-going maintenance program. Signage would be placed on the right of way and at the fenced-in line break valve locations to warn people of the presence of the sour gas pipeline.

Westcoast indicated that flaring emissions from the pipeline, occurring primarily from pigging operations, would meet the maximum desirable SO_2 emission levels of 450 micrograms/cubic meter/hour as defined by the Alberta ambient air quality guidelines and the Canada and British Columbia air quality objectives. Westcoast also stated that its existing environmental health and safety policies dealing with SO_2 emissions would be extended to the Project and that any instances where the air quality guidelines or objectives are exceeded would be documented and operating procedures would be modified to prevent the recurrence of any such event.

Westcoast clarified that annual CO_2 emissions from the Project would be16 tonnes and that these quantities are small in comparison to sources within its system, within the industry, and from other consumers of hydrocarbon products. Westcoast quoted material from Natural Resources Canada 2001 that states the total emissions of CO_2 in Alberta in 2000 was 200 million tonnes.

Although it does not have emissions data for the Compass Hill generator, Westcoast stated that the 400 watt thermo-electric generator unit would consume about 13 litres of kerosene per day.

Accidents and Malfunctions

Westcoast submitted updated results of the consequence assessment incorporating the revised valve locations discussed in Chapter 2. Revised results show that a three minute average ground level H_2S concentration of 20 ppm would occur at a maximum distance of 64.9 km, 100 ppm would occur at a maximum distance of 16.4 km, while a concentration relating to a one percent probability of lethality would occur at a distance of 10.3 km. These conditions were all predicted to occur as a result of a guillotine rupture of the longest segment of the pipeline (KP 54 to KP 95).

Westcoast stated that the consequence results for the Project will be reviewed with provincial agencies during development of the emergency procedures manual for these facilities.

6.2.2 Intervenors

Mr. Mackie stated the worst case scenario modelling of an accident or malfunction should be based on the possibility of a rupture occurring at a valve site itself. Such a failure would permit two consecutive pipeline segments to release gas as opposed to the one pipeline segment used in the Westcoast modelling.

Ms. Biem stated that the proposed emergency procedures manual should include specific criteria and procedures for notification of guide outfitters, trappers and others who are likely to be in the vicinity of the right of way.

Wapiti expressed concern that the H_2S warning signs on roads used by Wapiti would have a negative impact on its business due to the potential for its clients to perceive an increased risk. Wapiti also expressed concern regarding the negative effects to wildlife from SO_2 and remnants of H_2S released during flaring.

6.3 Conclusions and Recommendations

The Project would transport natural gas with a concentration of 13 percent H_2S. The information provided by Westcoast with respect to H_2S gas dispersion modeling is satisfactory. Westcoast's analysis of the worst case scenario is acceptable. Prior to placing the Project in service, Westcoast is required to have an emergency procedures manual in place to address the safety of all persons within the emergency planning zone.

The emergency procedures manual is a vital component for the safe operation of a sour gas pipeline. On 24 April 2002, the Board issued a letter to all companies highlighting the emergency preparedness and response requirements in the *Onshore Pipeline Regulations 1999* and clarifying the expectations for emergency preparedness and response programs. Westcoast would be expected to include the expected elements from that letter in their emergency preparedness and response programs. Once prepared in accordance with the Board's direction, the emergency procedures manual would address the concerns expressed by Mr. Mackie and Ms. Biem.

It is concluded that the burning of 13 litres of kerosene fuel per day by the generator at Compass Hill would result in negligible emissions.

In response to Wapiti's concern about signage, it is noted that signage on the right of way is one of the generally accepted methods of alerting the public to the presence and potential hazards of a pipeline.

For this reason, it is recommended that:

> ***Recommendation 1:***
>
> Westcoast shall, at least 30 days prior to placing the Project in service or as otherwise directed by the Board, file the emergency procedures manual required by section 32 of the Board's *Onshore Pipeline Regulations 1999*.

Westcoast identified several factors, including its proposed operating procedures, design standards, and emergency response program, that would minimize adverse environmental effects associated with accidents and malfunctions. Given these factors and the fact that the overall risk of having an accident or malfunction is low, such events are not likely to cause significant adverse environmental effects.

With respect to potential fugitive SO_2 and CO_2 emissions the Project is not likely to cause significant adverse environmental effects on air quality.

Chapter 7

Fish and Fish Habitat

7.1 Westcoast Submission - Revised Draft CSR - 4 January 2002

7.1.1 Existing Conditions

Construction of the Grizzly Extension Pipeline and Weejay Lateral will require crossings of 60 watercourse crossings in three sub-basins to the Peace River drainage between the tie-in connection in British Columbia and the well site terminus (5-3-63-11 W6M) in Alberta. Preliminary identification and enumeration of streams and rivers was carried out using digital 1:50,000 Watershed Atlas and 1:50,000 NTS map sheets. Based on this overview, the Project will intersect 47 watercourse crossings in the Wapiti River watershed, twelve streams of the Narraway River watershed, and one stream in the Murray River watershed (60 watercourse crossings total). The route intersects a number of high value fisheries streams, including two rivers and several named streams. Nearly 79% of the watercourse crossings occur in the Wapiti River watershed, with most of the crossings occurring in headwater tributaries.

Field surveys were conducted in the fall of 2000 (RL&L 2001a) and again during spring 2001 (RL&L 2001b) to characterize the quality of fish and fish habitat and to verify species assemblages of fish at each of the 60 watercourse crossings. Watercourse crossing locations are illustrated in Figure 7-1. Habitat assessments involved describing the physical attributes of each watercourse based on factors such as discharge, water depth, substrate type, and in-stream cover, as these are major determinants of the quality of fish habitat for spawning and rearing. In-stream habitat was assessed within 100 m upstream and downstream of the proposed RoW (if the channel width was less than 10 m wide) or a distance equivalent to 10 times the channel width if the stream channel exceeded 10 m in width. For major systems like the Wapiti and Narraway rivers, habitat was assessed a minimum of 500 m upstream and 1,000 m downstream of the proposed RoW. Physical habitat (riffles, pools, runs, flats) was classified according to the RL&L classification system (O'Neil and Hildebrand 1986) and the length and width of each section of discrete habitat unit was measured. Stream banks within each habitat transect were also evaluated for stability. The spring 2001 survey was conducted in order to confirm use by spring spawning species (*i.e.*, Arctic grayling) and spring habitat conditions, especially in the previously identified productive fisheries streams. In addition, the spring work was used to supplement fall 2000 data for a number of watercourses where crossing locations were modified as a result of routing adjustments.

The results of the baseline studies indicated that mountain whitefish and bull trout were common salmonids in all waters where fish were encountered (Table 7-1). Results of the spring 2001 fisheries survey (RL&L 2001b) were consistent with the fall 2000 survey (RL&L 2001a) in that there was a similar assemblage of fish species and, notably, an absence of cutthroat trout and Arctic grayling in the catch. For the purpose of this assessment it is conservatively assumed that Arctic grayling may occur in some of the tributaries to the Narraway during the spring as they migrate into these streams to spawn.

Northern pike and walleye were not present during the field survey although they are reportedly found in the Peace River system including the lower reaches of tributaries in the basin. Other indigenous fish species include sculpin species and various cyprinids, catastomids, and percopsids. Gasterosteids are also reported to occur in waters throughout the LSA, including pearl dace and mountain sucker, both listed as vulnerable in BC. Rainbow trout, brook trout, and cutthroat trout have been introduced to the Peace River drainage basin, with populations documented in the Narraway river system. These fish species are not considered common, however, as their distribution is thought to have remained limited to the vicinities of their introduction. Refer to Table 7-2 for a summary of fish species reported to inhabit watercourses in the study area.

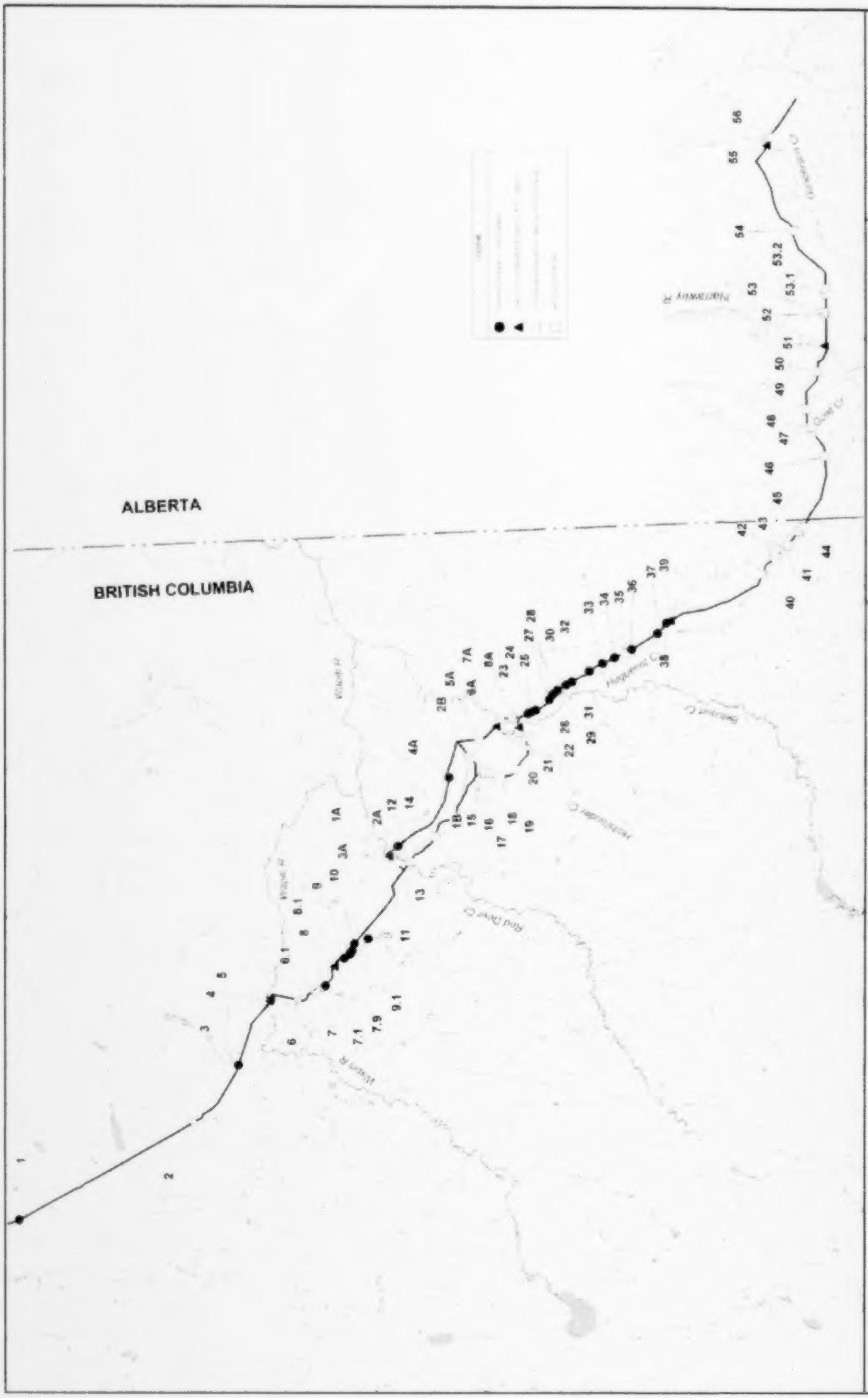
Using the information collected during the field investigation, each stream to be crossed has been classified according to the DFO Habitat Conservation and Protection Guidelines (1998). These guidelines prescribe high, moderate and minimum levels of protection for each type or class of habitat. In this scheme, the Class 1 designation represents streams with critical habitat that, therefore, require the highest level of protection. Class 2 streams contain areas used by fish for feeding, rearing and migration, which while important to the fish stock, are not considered critical habitat. Class 2 streams call for a moderate level of protection. Class 3 refers to streams with marginal fish habitat, which require a lower level of protection. Of the 60 watercourse crossings sampled, seven have been determined to be Class 1, two as Class 2, and 51 as Class 3 (refer to Table 7-1 for further detail regarding Class 1 & 2 watercourses). The Class 1 streams provide a variety of habitats important for spawning, rearing, and over-wintering. The Class 2 streams did not appear to be used by sport fish species in the vicinity of the crossings although the habitat present could support various life stages. Class 3 streams (refer to EPP - Stream Crossing Report, Table 2) had habitats that were considered poor or unsuitable for fish populations (*i.e.*, shallow, narrow channels, lacking in-stream cover, and intermittent). The classifications for each stream to be crossed by the Project are reported in RL&L (2001a, 2001b). There are also a number of ephemeral drainages that have been identified on 1:20,000 scale environmental alignment sheets that are considered to be unsuitable for fish populations and were not included in the scope of field investigations. These drainages will be managed as Class 3 streams in the development of mitigation plans.

The relatively large number of Class 3 streams evaluated during the survey, compared with Class 1 and Class 2 streams, is mainly due to the selected alignment of the pipeline route. Apart from the necessity to cross two rivers (*i.e.*, Wapiti and Narraway Rivers) and five named creeks (Red Deer, Holtslander, Belcourt, Huguenot, Gunderson, and Goat creeks), the pipeline route mainly traverses the headwater areas of tributaries. These crossings are typically ephemeral, small in channel size, and of steep gradient, all of which limit the potential use by resident fish populations.

7.1.2 Boundaries

7.1.2.1 Spatial Boundaries

Streams within the Murray, Wapiti and Narraway River watersheds provide habitat for reproduction and rearing of Arctic grayling and bull trout although a number of streams have either natural (*e.g.*, cascades, waterfalls) or manmade (*e.g.*, hanging culverts) barriers that limit fish distribution. As the pipeline route passes through high-elevation terrain, many of the waters to be crossed are intermittent headwater tributaries to larger systems. Despite the fact that many of these streams did not support fish at the time


ALBERTA
BRITISH COLUMBIA
Narraway R
Huguenot C
Red Deer C
Wapiti R
1
2
3
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2B
3A
4A
5A
6A
7A
8A
NORTH

WESTCOAST GRIZZLY EXTENSION PIPELINE

Proposed Watercourse Crossing Locations

7-1

Table 7-1
Summary of Class 1 and Class 2 Watercourse Crossings

K.P.	Crossing No.	Stream Name	Watercourse Category	DFO Class.	Fish Species Captured	Vehicle Crossing Method	Pipeline Crossing Method	Alternate Crossing Method
British Columbia								
20.2	01-2	Wapiti River	Major	1	Bull trout, Mountain whitefish	Temporary[1] Bridge	Aerial Span	None
28.9	01-6	Unnamed Trib. To Wapiti River	Secondary	1	Bull trout	Temporary Bridge	Isolate[3]	None
37.7	01-29	Red Deer Creek	Primary	1	Bull trout, Mountain whitefish, Sculpin sp.	Existing Bridge	Aerial Span	None
50.4	01-12	Holtslander Creek	Primary	2	None	Temporary Bridge	Isolate	None
51.9	23	Belcourt Creek	Primary	1	Bull trout[4], Mountain whitefish[4]	Existing Bridge	Directional Drill	Aerial
64.7	01-19	Huguenot Creek	Primary	1	Bull trout	Temporary[2] Bridge	Isolate	None
Alberta								
89.4	01-31	Narraway River Back Channel	Secondary	1	None	None/Temp. Bridge	Isolate	None
89.2	01-23	Narraway River	Major	1	Arctic grayling[4], Cutthroat trout[4], Bull trout, Mountain whitefish, Sculpin sp.[4]	Temporary[2] Bridge	Span Aerial	None
105	01-26b	Gunderson Creek	Primary	2	Sculpin sp.[5]	None/Temp. Bridge	Directional Drill	Isolate

Notes:

1. Temporary bridge over Wapiti River will be used for span construction only; pipeline construction equipment will not use the bridge.
2. Temporary bridge over Huguenot Creek and the Narraway River will be used for crossing and pipeline construction although some pipeline construction services (log hauling, stringing, etc.) will not use the bridge.
3. Isolated Pipeline Crossing Method - Dam & Pump or flume isolated crossing if flows warrant.
4. Identified during fall 2000 survey.
5. Based on previous sampling downstream (fall 2000) and upstream (spring 2001) of the proposed crossing.

Table 7-2
Common and Scientific Names of Fish Species Reported to Inhabit Watercourses Within the Study Area

Family	Common Name	Scientific Name	Code[1]
Sportfish			
Salmonidae	Bull trout	Salmo confluentus (Suckley)	BLTR
	Brook trout	*Salmo fontinalis* (Mitchell)	BKTR
	Rainbow trout	*Oncorhynchus mykiss* (Walbaum)	RNTR
	Cutthroat trout	*Oncorhynchus clarki* (Richardson)	CTTR
	Mountain whitefish	*Prosopium williamsoni* (Girard)	MNWH
	Arctic grayling	*Thymallus Arcticus* (Pallas)	ARGR
Esocidae	Northern pike	Esox lucius (Linnaeus)	NRPK
	Walleye	*Stizostedion vitreum* (Smith)	WALL
Gadidae	Burbot	Lota lota (Linnaeus)	BURB
Non-sportfish			
Catostomidae	Longnose sucker	Catostomus catostomus (Forster)	LNSC
	White sucker	*Catostomus commersoni* (Lacepede)	WHSC
	Mountain sucker	*Catostomus platyrhynchus* (Cope)	MNSC
Cyprinidae	Lake chub	Couesius plumbeus (Agassiz)	LKCH
	Pearl dace	*Margariscus margarita* (Cope)	PRDC
	Fathead minnow	*Pimephales promelas* (Rafinsque)	FTMN
	Longnose dace	*Rhinichthys cataractae* (Valenciennes)	LNDC
	Northern redbelly dace	Phoxinus eos (Cope)	NRDC
	Finescale dace	*Chrosomus neogaeus* Cope	FNDC
Percopsidae	Trout-perch	Percopsis omiscomaycus (Walbaum)	TRPR
Gasterosteidae	Brook stickleback	Culaea inconstans (Kirtland)	BRST
Cottidae	Spoonhead sculpin	Cottus ricei (Nelson)	SPSC
	Slimy sculpin	Cottus cognatus Richardson	SLSC

Note 1: Code system according to Mackay *et al.* (1990).

of the surveys and were considered not to provide suitable fish habitat, they provide important water and food resources to downstream habitats capable of sustaining fish. For this reason, the spatial boundary within which proposed Project activities could potentially interact with Fish and Fish Habitat is considered to be the area 500 m upstream and 1,000 m downstream of the proposed crossing locations (Local Study Area - LSA). This boundary encompasses the extent to which the Project could potentially interact with fish or fish habitat either by direct disturbance or by potential downstream transport of a deleterious substance.

7.1.2.2 Temporal Boundaries

The temporal boundaries for the proposed development encompass the period of construction and reclamation at and near the watercourse crossings. The construction period for the Phase I portion of the Project is anticipated to occur from mid-July to October 2002. The Phase II section of the pipeline would be constructed in late fall 2002 and winter 2003 after freeze up. All construction work would be completed by the mid-March 2003. Operation activities are anticipated to last for 40 years or more. The time frame where environmental effects such as erosion, or malfunctions or accidents could occur encompasses the construction, operations and ultimate decommissioning and abandonment phases of the Project.

Due to differences in spawning and incubation periods among fish species that may inhabit watercourses crossed by the proposed project, recommended timing windows for each species varies (refer to Table 7-3). The proposed construction period for in-stream work at fish bearing streams (required for 3 crossings) is between July 15 and August 31 to avoid these sensitive periods (*i.e.*, spawning and incubation).

Table 7-3
Timing Concerns for Various Species of Fish in the Peace River Drainage Basin*

Species	Peace River Drainage Basin		
	Spawning Time	Incubation Complete	General Timing Constraint
Arctic grayling	Apr 15 to Jun 10	Jun 30	Apr 20 to Jul 5
Mountain whitefish	Sep 15 to Oct 23	Apr 1	Sep 10 to Apr 5
Bull trout	Sep 1 to Oct 30	Mar 20	Sep 1 to Mar 25
Brook trout	Oct 1 to Nov 15	Mar 20	Oct 1 to Mar 25
Rainbow trout	May 15 to Jun 15	Aug 15	May 15 to Aug 15
Northern pike	Apr 15 to Jun 30	Jul 15	Apr 15 to Jul 15
Walleye	Apr 15 to May 30	Jun 30	Apr 15 to Jun 30

*Source: Alberta Transportation and Utilities, Forestry, Lands and Wildlife Division (1987 and 1992)

7.1.2.3 Administrative Boundaries

Bull trout is a blue-listed species in British Columbia. It is considered a species of special management concern in Alberta and vulnerable (S3; blue listed) in British Columbia (Government of British Columbia 2001). Blue listed species are considered to be at risk but are not endangered or threatened. A Bull Trout Species Management and Recovery Plan was prepared in 1995 and is presently being implemented for this species (Berry 1994). Pearl dace and mountain sucker are both listed as vulnerable species in BC. The Narraway River Environmental Sensitive Area (ESA) is designated based on wildlife habitat values and key fisheries habitat for bull trout, Arctic grayling, mountain whitefish, rainbow trout, cutthroat trout and diversity of riparian landforms. In consideration of the sensitivities associated with these species and other fish species that may be affected, the objective of project design and mitigation planning with respect of fisheries resources has been to achieve no net loss of fish or fish habitat, consistent with DFO policy.

7.1.2.4 Technical Boundaries

Quantitative and qualitative tools were used to assist the environmental effects analysis including habitat assessments of current baseline conditions, fish sampling, current best management practices and professional judgement.

7.1.3 Residual Environmental Effects Criteria

Residual environmental effects rating criteria for Fish and Fish Habitat required consideration of project activities, project location, proposed mitigation, and data collected during the fall 2000 and spring 2001 fish sampling and habitat assessments. The definition for rating of the significance of residual environmental effects on fish and fish habitat, based on documented occurrence of valued fish species of management concern in the Project area, are based on DFO's policy of no net loss of fish or fish habitat.

A *significant residual environmental effect* for Fish and Fish Habitat is one that may alter the valued habitat physically, chemically, or biologically in quality or extent, such that there is a decline in the diversity or abundance of species that may utilize habitat. This environmental effect may be reflected by a decline in abundance or change of habitat components (*e.g.*, sediment, habitat quality, substrate composition, food resources, water quality, and riparian vegetation) that would result in a net loss of fish or fish habitat.

A *not significant residual environmental effect* for Fish and Fish Habitat is one that does not result in decline in abundance or change of habitat components and is not considered to be, or cause, a net loss of fish or fish habitat.

7.1.4 Evaluation of Project-related Environmental Effects

7.1.4.1 Potential Interactions

Potential interactions between the Project and fish and fish habitat have been identified in each of the construction and commissioning, operation and maintenance, and/or decommissioning and abandonment phases of the Project. There is also the potential for accidents, malfunctions and unplanned events related to the Project to interact with fish and fish habitat. Areas of potential interaction between Project activities and fish and fish habitat are shown in Table 7-4.

Table 7-4
Potential Interaction of the Project with Fish and Fish Habitat

Project Activities and Physical Works	Potential Environmental Effects		
	Change in habitat	Barriers to fish passage	Direct mortality
Construction and Commissioning			
Access Development	X	X	X
RoW Preparation	X		
Watercourse crossings (including blasting)	X	X	X
Clean-up	X		
Testing	X		
Operation	X		X
Decommissioning and Abandonment	X		X
Accidents, Malfunctions and Unplanned Events			
Pipeline rupture/leak	X		X
Spill or accidental release of hazardous materials	X		X
Loss of containment during watercourse crossing(s)	X		X

The introduction of sediment to watercourses is the source of potential impacts of greatest concern during the construction of pipelines, either as a result of erosion and transport of sediment from work areas adjacent to streams or as a result of in-stream work. Increased sediment loads entering a watercourse may have adverse effects on fish and fish habitat. The effects of introduced suspended sediment on fish are many and varied, and can range from direct mortality (in extreme cases) to various behavioral and sublethal effects, including: habitat avoidance and redistribution; reduced feeding and growth; respiratory impairment; and, reduced tolerance to disease (Waters 1995). Deposited sediment has the potential to reduce survival of eggs and larvae, and reduce future habitat suitability for a range of critical life requisite functions (*e.g.*, spawning, egg incubation, rearing, over wintering). The highest risk for erosion and sedimentation from the sites will occur as a result of grading at approaches, trenching, backfilling and clean-up.

The magnitude of these adverse effects depends on the type and concentration of suspended sediment, the length of time the sediment is in the water column or in/on the substrate (duration), the species and life stage of fish present, and the nature and extent of the habitat affected.

The removal of riparian vegetation during clearing for construction could adversely affect fish habitat, as shade provided by the canopy is important to maintaining water temperatures suitable for salmonid species. Water withdrawal and release, as required for pipeline pressure testing, may also lead to fish mortality, (*e.g.*, if proper screening is not used, or increased sedimentation if discharge waters are not properly managed).

Sections of the proposed RoW that pass through bedrock areas may require blasting if the rock is not suitable for ripping. Blasting in and adjacent to watercourses may cause direct deleterious effects upon fish health from blast percussion, through the introduction of suspended solids in streams, and alteration of habitat.

Improperly installed pipeline or vehicle crossing structures can disrupt surface water flow and prevent fish passage. Disruption of stream flow may interrupt downstream water supplies or result in habitat loss and/or mortality of fish and benthic invertebrates due to stranding or reduced flows. Also there is the potential that in-stream construction activities may be scheduled outside of the fisheries construction windows and may interfere with sensitive periods for fall spawning species (*e.g.*, bull trout).

Potential interactions during the operation and decommissioning/abandonment phase of the Project may include increased public access to streams along the RoW with ensuing risk of rutting and erosion of stream banks and direct mortality associated with increased fishing pressure. Maintenance activities in or near watercourses may result in erosion and sedimentation.

Accidents, malfunctions and unplanned events may interact with fish and fish habitat in a manner that results in change in habitat and/or direct mortality. Malfunctions and accidents can occur throughout the life of the Project. Events during construction may include a loss of containment of a stream isolation causing a release of silt-laden water or an inadvertent introduction of drill fluids to surface waters (through fractures in the ground or loss of containment) during directional drill activities. A pipeline rupture during operations may result in a toxic level of gas being released into a stream or may indirectly lead to sedimentation from required emergency repair activities.

7.1.4.2 Environmental Effects Analysis

7.1.4.2.1 Construction and Commissioning

An evaluation of general project-related environmental effects, for construction and commissioning, is presented in Table 7-4 and the following discussion highlights key factors in the analysis.

A considerable level of environmental effects mitigation is provided through route selection (Section 2.1.4) and in the selection of stream crossing techniques (Table 7-5). Trenchless crossing techniques (Horizontal Directional Drill and Aerial) have been selected for five of the nine designated Class 1 and 2 streams to avoid disturbance of critical and important fish habitat. All other flowing watercourses, including the Narraway side channel, three smaller Classes 1 and 2 streams and all flowing Class 3 streams will utilize an isolated trench crossing method.

Table 7-5
Environmental Effects Assessment Matrix: Fish and Fish Habitat – Construction and Commissioning

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Ecological Context
Access development	Change in habitat (A)	Use temporary bridges at all fish bearing streams, maintain original channel width (EPP Appendix 2)	1	1	1/1	R	2
	Direct mortality (A)	Isolate work area and salvage fish prior to construction of stream crossings EPP Appendix 2).	1	1	1/1	I	2
RoW preparation	Change in habitat (A)	Minimize removal of vegetation within 30 m of streams (especially on banks). (EPP Section 12).	1	1	2/1	R	2
Watercourse crossings	Change in habitat (A)	Control sediment deposition to streams ;restore stream bed to pre-construction status (EPP Section 12, Appendix 2)	1	1	1/1	R	2
	Barriers to Fish Passage (A)	Maintain downstream flow, limit duration of isolated crossings (EPP Appendix 2)	1	1	1/1	R	2
	Direct mortality (A)	Isolate work area and salvage fish before commencing crossing work, conduct crossings (EPP, Appendix 2), minimize sediment deposition to streams, follow DFO blasting guidelines (EPP Section 12)	1	1	1/1	I	2

Mainline construction	Change in habitat (A)	Control sediment deposition to streams (EPP Section 13, Appendix 2)	1	1	1/1	R	2
Clean-up	Change in habitat (A)	Control sediment deposition to streams	1	1	1/1	R	2
Testing	Change in habitat (A)	Adhere to for hydrostatic test water withdrawal and disposal requirements (EPP Section 7)	1	1	1/1	R	2

KEY

Magnitude:
1 = Low: Localized disruption of fish habitat over a short period of time with no permanent destruction or alteration of fish habitat quality or type.
2 = Moderate: Permanent alteration of marginal fish habitat such that quality or type may change. No destruction of in-stream area associated with the alteration.
3 = High: Permanent alteration or destruction of fish or valued fish habitat. Valued fish habitat is considered to be high quality spawning, rearing or over-wintering areas.

Geographic Extent:
1 = Environmental effects restricted to stream within RoW or extra workspace
2 = Environmental effects restricted to stream within LSA
3 = Environmental effects affect stream(s) beyond LSA.

Duration:
1 = Short term: Effects are measurable for < 1 year.
2 = Medium term: Effects are measurable for 1 to 10 years.
3 = Long term: Effects are measurable for > 10 years.

Frequency:
1 = Occurs once.
2 = Occurs rarely and at sporadic intervals.
3 = Occurs on a regular basis and at regular intervals.
4 = Continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological Context:
1 = Area is relatively pristine or not adversely affected by human activity.
2 = Evidence of adverse environmental effects (e.g., existing stream crossings).

N/A = Not Applicable

E&SCP = Erosion and Sedimentation ControlPlan

EPP = Environmental Protection Plan

Various construction plans have been developed to mitigate the environmental effects of construction activities. Specific plans to mitigate environmental effects on fish and fish habitat are included in the Stream Crossing Report (EPP, Appendix 2), the Access Management Plan (EPP, Appendix 3) and the Directional Drilling Mud Release Contingency Plan (EPP, Section 16.2). These plans outline strategies and techniques to reduce sediment deposition in streams, minimize disturbances of riparian areas, minimize disturbances of in-stream habitats, and stabilize and restore stream banks following each crossing and minimize access by the public.

Westcoast has prepared a detailed Stream Crossing Report (EPP, Appendix 2) that clearly describes specific environmental protection techniques to be employed for each watercourse crossing. The report describes details on specific construction/contingency plans for each Class 1 and Class 2 crossing and a general plan for the Class 3 crossings. The plans include design considerations for isolated trench crossings (including water quality monitoring), site-specific mitigation and erosion control measures. Contingency measures for events such as a failed directional drill attempt are included (EPP Section 16). The Stream Crossing Report is incorporated into the EPP and will be submitted to DFO for review and approval.

Timing of in-stream activities can influence adverse environmental effects due to differences in spawning and incubation periods among fish species that may inhabit watercourses crossed by the proposed development. To minimize these environmental effects, in-stream work is proposed to be conducted during the period from July 15 through August 31 to avoid interference with sensitive fisheries periods. Westcoast intends to conduct all in-stream work on fish-bearing streams (Table 7-1) within this construction window unless extenuating circumstances arise (*e.g.*, construction complications or adverse weather or flow conditions). The exception is at the side channel of the Narraway River, where current scheduling does not provide access into the area until fall or early winter.

For this crossing, and for any foreseeable contingency situations, Westcoast will apply for site-specific approvals from the appropriate regulatory authorities for the extension of activities outside of these construction windows. These approvals will be based upon site-specific mitigation and monitoring plans.

With the exception of the five "trenchless" watercourse crossings identified in Table 7-1, all other flowing watercourses will be crossed using either a typical dam and pump isolated trench watercourse crossing technique or, where flows warrant, a typical flume isolated trench watercourse crossing technique. With respect to in-stream construction, the principal environmental effect that may occur during construction and commissioning is a change in fish habitat associated with the potential for sand, silt and clay to become suspended in a watercourse and cause physiological stress effects and/or be deposited in a location and manner such that there is an alteration or destruction of fish habitat. This concern primarily relates to the four isolated trench stream crossings that are considered to have moderate to high quality fisheries habitat. Mitigation measures to reduce these potential effects include selection of isolated stream crossing methods, where the excavated area is isolated from the stream flow, and the installation of temporary bridges to provide vehicle access with minimal encroachment on the watercourse (refer to schematics in EPP, Appendix 1). As well, there is considerable emphasis placed on the implementation and maintenance of a number of erosion and sedimentation preventative measures, as described in detail in the aforementioned plans.

Non-flowing watercourses holding standing water may undergo a modified isolated trench crossing technique. This technique is similar to an isolated trench crossing technique but the upstream water is not pumped or flumed. The isolation dams serve to retain sediments at the excavation point thereby minimizing disturbance to the remaining standing water (EPP, Appendix 1). Dry watercourse channels and groundwater seeps will be crossed using the typical open cut watercourse crossing technique. Erosion and sediment control measures will be applied on a site-specific basis. Minimum requirements for all flowing watercourses and approach slopes and for non-flowing watercourses in the vicinity of flowing watercourses are outlined in the EPP and the detailed Stream Crossing Report (EPP, Appendix 2).

The majority of the watercourse crossings are assigned a Class 3 habitat rating, as defined by the DFO Habitat Conservation and Protection Guidelines, and provide low productive capacity with little or no fish habitat. It is anticipated that most of these crossings will be done using open trench techniques during periods when flows are absent. As described in the Stream Crossing Report (EPP - Appendix 2, Section 7.1), dry ephemeral drainages and upland areas in the vicinity of flowing streams will be subject to mitigation to prevent transport of sediment into fish bearing streams. Class 3 stream crossing activities will typically be of short duration (*i.e.*, less than 1 day).

In the event that watercourse crossings of the proposed RoW areas may require blasting, the amount of blasting required for construction and associated RoW grading where necessary, is anticipated to be minimal and localized to the pipeline trench width of (3-5 m wide). Furthermore, the effects from blasting to fish and fish habitat would be minimized through implementation of mitigative measures in accordance with Guidelines for the Use of Explosives in Canadian Fishing Waters (Wright and Hopky, 1998) (EPP Section 12). With these mitigation measures, residual environmental effects from blasting activities are predicted to be negligible.

Water withdrawn for hydrostatic testing of the pipeline will be drawn from approved sources and will not exceed maximum withdrawal rates specified by permits. Intake pipes on pumping equipment will be screened in accordance with the DFO Fish Screening Directive (DFO 1990). Testing activities will follow the Code of Practice for Discharge of Hydrostatic Test Water from Hydrostatic Testing of Petroleum Liquid and Natural Gas Pipelines (Alberta Environmental Protection 1998a). Test water will be discharged at pre-approved locations and monitored to ensure that no erosion or flooding occurs. All methanol or ether used for testing as a drying agent, will be recovered in tanks or tank trucks and disposed of in accordance with regulatory requirements (EPP Section 7 and 15).

Based on consideration of the specific effects related to construction and commissioning of the Project and the mitigation proposed, the environmental effects of the construction and commissioning phase are not anticipated to result in decline in abundance or change of habitat components. There is no predicted net loss of fish or fish habitat and the potential environmental effects are therefore considered not significant.

7.1.4.2.2 Operation

Table 7-6 presents the assessment of environmental effects of operation on fish and fish habitat.

Potential environmental effects from the interaction of operation and maintenance activities with fish and fish habitat, are changes in habitat and direct fish mortality. Also, loss of riparian habitat through brush removal during operations will be minimized by maintaining a minimum 10-m buffer zone during operations vegetation management and by replanting shrub vegetation following construction. Effects of erosion and sedimentation following construction will be mitigated through implementation of permanent erosion control measures during final clean-up and reclamation of the RoW and crossing locations. These measures, predicted to mitigate long-term effects of erosion, are described in detail in the Stream Crossing Report (EPP, Appendix 2). Detailed mitigation plans also provide for establishment of a post-construction monitoring and issue resolution program that would address any erosion concerns that require follow-up action (refer to EPP, Section 17).

Table 7-6
Environmental Effects Assessment Matrix: Fish and Fish Habitat – Operation

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Ecological Context
Operation	Change in habitat (A)	Replant riparian areas, implement access control measures, monitor for erosion control and reclamation success and take remedial action as necessary (EPP Section 12, Appendix 2)	1	1	3/2	R	2
	Direct mortality (A)	Discourage fishing through access management (EPP Appendix 2)	1	1	3/2	I	2

KEY Magnitude: 1 = Low: Localized disruption of fish habitat over a short period of time with no permanent destruction or alteration of fish habitat quality or type. 2 = Moderate: Permanent alteration of marginal fish habitat such that quality or type may change. No destruction of in-stream area associated with the alteration. 3 = High: Permanent alteration or destruction of fish or valued fish habitat. Valued fish habitat is considered to be high quality spawning, rearing or over-wintering areas.	Geographic Extent: 1 = Environmental effects restricted to stream within RoW or extra workspace 2 = Environmental effects restricted to stream within LSA 3 = Environmental effects affect stream(s) beyond LSA. Duration: 1 = Short term: Environmental effects are measurable for < 1 year. 2 = Medium term: Environmental effects are measurable for 1 to 10 years. 3 = Long term: Environmental effects are measurable for > 10 years.	Frequency: 1 = Occurs once. 2 = Occurs rarely and at sporadic intervals. 3 = Occurs on a regular basis and at regular intervals. 4 = Continuous Reversibility: R = Reversible I = Irreversible	Ecological Context: 1 = Area is relatively pristine or not adversely affected by human activity. 2 = Evidence of adverse environmental effects (e.g., existing stream crossings). N/A = Not Applicable EPP = Environmental Protection Plan

Direct fish mortality may result from increased fishing pressure by operation and maintenance staff, although the greatest potential for this environmental effect would likely arise from increased public access to streams. Access management and control is a priority in addressing potential project and cumulative environmental effects and proposed measures (refer to Access Management Plan - EPP, Appendix 3) will reduce extent and likelihood of increased fishing pressure by Westcoast staff and the public.

Based on consideration of the specific effects related to operations, and mitigation proposed, the predicted environmental effects are not anticipated to result in decline in abundance or change of habitat components that would result in a net loss of fish or fish habitat and are therefore considered not significant.

7.1.4.2.3 Decommissioning and Abandonment

Table 7-7 presents the assessment of environmental effects of decommissioning and abandonment on fish and fish habitat.

Table 7-7
Environmental Effects Assessment Matrix: Fish and Fish Habitat – Decommissioning and Abandonment

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Ecological Context
Operation	Direct mortality (A)	Implement access management to reduce public access and angling pressure (EPP Appendix 2)	1	2	3/3	I	2

KEY

Magnitude:
1 = Low: Localized disruption of fish habitat over a short period of time with no permanent destruction or alteration of fish habitat quality or type.
2 = Moderate: Permanent alteration of marginal fish habitat such that quality or type may change. No destruction of in-stream area associated with the alteration.
3 = High: Permanent alteration or destruction of fish or valued fish habitat. Valued fish habitat is considered to be high quality spawning, rearing or over-wintering areas.

Geographic Extent:
1 = Environmental effects restricted to stream within RoW or extra workspace
2 = Environmental effects restricted to stream within LSA
3 = Environmental effects affect stream(s) beyond LSA.

Duration:
1 = Short term: Environmental effects are measurable for < 1 year.
2 = Medium term: Environmental effects are measurable for 1 to 10 years.
3 = Long term: Environmental effects are measurable for > 10 years.

Frequency:
1 = Occurs once.
2 = Occurs rarely and at sporadic intervals.
3 = Occurs on a regular basis and at regular intervals.
4 = Continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological Context:
1 = Area is relatively pristine or not adversely affected by human activity.
2 = Evidence of adverse environmental effects (e.g., existing stream crossings).

N/A = Not Applicable

Upon decommissioning and abandonment of the pipeline facility, the watercourse crossing pipe sections will be pressurized with inert gas, capped, and left in the ground. Disturbances associated with this phase will be negligible. Potential environmental effects from interaction of decommissioning and abandonment activities with fish and fish habitat are related to the opportunity for direct fish mortality due to increased fishing pressure and mortality as a result of increased accessibility.

Mitigation measures to offset these environmental effects consist of implementation of the Access Management Plan (EPP, Appendix 3) that is intended to deter vehicle access along the corridor into previously inaccessible areas. Upon abandonment, the pipeline RoW is also expected to re-establish a shrub and tree cover that will also impede access.

Effects from potential erosion problems upon decommissioning are expected to be negligible. Access control measures will work to prevent erosion and sedimentation that might be caused by vehicle traffic on stream banks and approaches to watercourses. As well, watercourse crossings will not be redisturbed as pipe will be left in the ground at decommissioning.

Based on consideration of the environmental effects of the individual components required for decommissioning and abandonment the environmental effects are considered not significant.

7.1.4.2.4 Accidents, Malfunctions and Unplanned Events

Table 7-8 presents the assessment of potential environmental effects for accidents, malfunctions and unplanned events on fish and fish habitat.

The principal environmental effects associated with unplanned events are effects of pipeline leaks/rupture, hazardous materials spills and loss of containment during trenched watercourse crossings.

The Waste Management Plan (EPP, Section 15) and the Spill Contingency Plan (EPP, Section 16.3) outline spill reporting, containment, and response measures to be followed in the event of a hazardous materials spill. In addition, the fisheries protection measures and the general erosion and sedimentation control techniques outlined in the EPP (Section 12) and the detailed Stream Crossing Report (EPP, Appendix 2) provide additional protection measures to prevent hazardous materials from entering watercourses.

Table 7-8
Environmental Effects Assessment Matrix: Fish and Fish Habitat – Accidents, Malfunctions and Unplanned Events

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Ecological Context
Pipeline leak or rupture	Change in habitat (A)	Implement ERP	2	1	1/1	R	1
	Direct mortality (A)	Implement ERP	1	2	1/1	I	1
Spills or accidental release of hazardous materials	Change in habitat (A)	Implement ERP and EPP (Section 16)	1	2	1/1	R	1
	Direct mortality (A)	Implement ERP and EPP (Section 12, 16, Appendix 2)	1	2	1/1	I	1
Loss of containment during watercourse crossings	Change in habitat (A)	Implement EPP (Section 16)	2	2	1/1	R	1
	Direct mortality (A)	Implement EPP (Section 16)	1	2	1/1	I	1

KEY

Magnitude:
1 = Low: Localized disruption of fish habitat over a short period of time with no permanent destruction or alteration of fish habitat quality or type.
2 = Moderate: Permanent alteration of marginal fish habitat such that quality or type may change. No destruction of in-stream area associated with the alteration.
3 = High: Permanent alteration or destruction of fish or valued fish habitat. Valued fish habitat is considered to be high quality spawning, rearing or over-wintering areas.

Geographic Extent:
1 = Environmental effects restricted to stream within RoW or extra workspace
2 = Environmental effects restricted to stream within LSA
3 = Environmental effects affect stream(s) beyond LSA.

Duration:
1 = Short term: Environmental effects are measurable for < 1 year.
2 = Medium term: Environmental effects are measurable for 1 to 10 years.
3 = Long term: Environmental effects are measurable for > 10 years.

Frequency:
1 = Occurs once.
2 = Occurs rarely and at sporadic intervals.
3 = Occurs on a regular basis and at regular intervals.
4 = Continuous

Reversibility:
R = Reversible
I = Irreversible

Ecological Context:
1 = Area is relatively pristine or not adversely affected by human activity.
2 = Evidence of adverse environmental effects (e.g., existing stream crossings).

N/A = Not Applicable
E&SCP = Erosion and Sedimentation Control Plan
EPP = Environmental Protection Plan
ERP = Emergency Response Plan

Loss of containment of stream flows during isolated open trench stream crossings has the potential to cause short-term release of sediment from the construction area to downstream habitats. The risk of this type of release, resulting from a failure of dam and by-pass installations is greater for large flow diversions associated with larger watercourses. The large watercourse crossings encountered by the proposed pipeline are all designed for a trenchless (*i.e.*, directional drill or span aerial crossing) installation. Other watercourses are smaller and considered readily constructible with conventional design. Given that there are only four fish-bearing watercourses where isolation is the primary crossing method and that all are considered of manageable size, a loss of containment is considered highly improbable, and it is predicted that a significant environmental effect will not occur.

An inadvertent release of drilling mud returns is possible where permeable soil and fractured bedrock substrates can, in uncommon circumstances, serve as conduits to the surface for drilling fluids. It should be noted that inadvertent returns at a specific location are typically temporary and cease as the drilling operation progresses beyond the area of fracture or as drilling is halted and drilling pressures stabilize. Drilling fluids used in horizontal directional drilling for pipeline installation are nontoxic and discharge of the amounts normally associated with an inadvertent release does not pose a threat to public health and safety or to the health of aquatic resources with adequate mitigation (*e.g.*, monitoring, containment, leak response. A detailed Directional Drill Mud Release Contingency Plan (EPP, Section 16.2) has been prepared for this project.

Based on consideration of the potential magnitude and likelihood of accidents, malfunctions and unplanned events, the environmental effects of these are rated not significant.

7.1.4.3 Summary of Project-related Environmental Effects

Given the determinations of potential residual environmental effects for the various Project phases (Table 7-9) overall environmental effects on fish and fish habitat are rated not significant.

Table 7-9
Summary of Project-related Environmental Effects: Fish and Fish Habitat

Phase	Residual Environmental Effects Rating
Construction and Commissioning	NS
Operation	NS
Decommissioning and Abandonment	NS
Accidents, Malfunctions and Unplanned Events	NS
Project Overall	NS

Key:
Residual environmental Effect Rating:
S = Significant Adverse Environmental Effect
NS = Not-significant Adverse Environmental Effect
P = Positive Environmental Effect

7.1.5 Monitoring and Follow-up

Westcoast will monitor water quality (primarily for TSS) for the duration of construction of each isolated watercourse crossing to ensure successful implementation of mitigation measures. Results of water quality monitoring programs will be documented and presented in a report to DFO. Working with DFO, Westcoast will attempt to quantify the success of mitigation measures in reducing or eliminating adverse effects (*i.e.*, habitat loss) and any identified residual effects will be addressed as a compensation issue in order to satisfy requirements for no net loss of fish and fish habitat.

Monitoring efforts during construction will also include visual observations of conditions at directional drill locations. Potential loss of drilling mud into a watercourse is a recognized hazard and monitoring of drilling pressure (and loss of pressure associated with a potential loss of fluid) and visual observations will confirm the occurrence of such an event. Where a loss of drilling fluid into a watercourse becomes apparent, the loss will be reported immediately to DFO and the contractor undertaking the directional drill will be prepared with a contingency plan covering the control and handling of any inadvertent drilling fluid migration. There also will be a water quality monitoring contingency implemented to quantify the extent of environmental effects (refer to Directional Drilling Mud Release Contingency Plan (EPP, Section 16.2)).

All construction activities will be inspected and monitored to ensure that erosion control structures are appropriately installed and maintained. Post-construction monitoring will be conducted for two years, following the first and second growing seasons, to evaluate site and habitat restoration and the success of bank protection and stability. Monitoring efforts will include reporting and issue resolution mechanisms to ensure compliance. Detailed monitoring program information is outlined in the EPP, Section 17.6.

7.2 Additional Submissions

7.2.1 Westcoast

Westcoast noted that the revised construction schedule would result in all crossings being constructed in frozen ground conditions. In the event that the winter construction window was missed, Westcoast committed that summer construction would take place during the fisheries window of 15 July to 31 August 2003.

Westcoast stated that the design of instream supports for temporary bridge crossings is based on a number of assumptions which were filed. Other factors such as scour area and streambed vibration would affect Westcoast's placement and installation of temporary bridges. Westcoast submitted site-specific bridge designs and estimates of instream disturbance for the Wapiti River, Red Deer Creek, Belcourt Creek, Narraway River, Narraway River Side Channel and Gunderson Creek. In addition, Westcoast submitted a revised construction plan for the Narraway River Crossing.

Pursuant to section 35(1) of the *Fisheries Act*, the Harmful Alteration, Disruption or Destruction (HADD)of fish habitat is prohibited unless authorized pursuant to section 35(2). Westcoast stated that it understood that in keeping with the guiding principal of No Net Loss set out in DFO's *Policy for the Management of Fish Habitat*, authorizations would be issued by DFO on the condition that measures were implemented to compensate for any habitat harmfully altered, disrupted or destroyed. Westcoast submitted that it would be seeking authorization from DFO for the potential HADD of fish habitat resulting from temporary bridge crossings on the Wapiti River, Belcourt Creek and Narraway River and outlined compensation measures that it would implement.

Westcoast is seeking permission from DFO to compensate for habitat loss through on-site works including removal of barriers to fish passage. The focus for compensation would be on re-establishing salmonid (e.g. bull trout) access into areas identified as suitable fish habitat by culvert removal and stream channel restoration.

During the operational phase of the Project, Westcoast would obtain permits from provincial and federal agencies, as required, for stream crossings on the right of way where there are no existing bridges. Potential impacts from stream crossings during operations include instream disturbance due to fording and bank disturbance. Mitigative measures to address these impacts would include scheduling repair work for dry or frozen ground conditions or low flow periods and following fish protection and erosion control requirements as documented in Westcoast's Environmental Protection Plan (EPP).

Westcoast submitted information for class 1 and 2 watercourse crossings as set out in table 7-10.

Table 7-10
Summary of Class 1 and 2 Watercourse Crossings

KP	Crossing Number	Stream Name	Pipe Installation Method	Vehicle Crossing Method	DFO Compensatory Measures	Applied for Contingency Plans
British Columbia						
20.2	01-2	Wapiti River	Aerial Span	Multi-span Temporary Bridge	Bridge pile driving/removal outside window period may require compensation	None
28.9	01-6	Unnamed Trib. to Wapiti River	Isolate	Temporary Bridge	None	None
37.7	01-29	Red Deer Creek	Aerial Span	Multi-span Temporary Bridge	None	None
50.4	01-12	Holtslander Creek	Isolate	Temporary Bridge	None	None
51.9	23	Belcourt Creek	Horizontal Directional Drill	Existing Bridge Contingency-Multi-Span Temporary Bridge	Bridge pile driving/removal outside window period may require compensation	Aerial Crossing with Multi-span Temporary Bridge
64.7	01-19	Huguenot Creek	Isolate	Temporary Bridge	None	None
Alberta						
89.4	01-31	Narraway River Side Channel	Isolate	Temporary Bridge	None	None
89.2	01-23	Narraway River	Isolate	Multi-span Temporary Bridge	Proposed instream use of concrete lock block bridge abutments may require compensation	None
105	01-26b	Gunderson Creek	Horizontal Directional Drill	Existing Bridge Contingency-Temporary Bridge	None	Isolated dam & Pump or flume crossing.

7.2.2 Department of Fisheries and Oceans Canada

DFO has determined that for its purposes, most of the impacts of the Project on fisheries resources can be dealt with through its standard mitigation measures. However, DFO authorizations under section 35(2) of the *Fisheries Act* would be required for the construction of stream crossings as the instream structures associated with several of the temporary working bridges are likely to cause HADD. DFO has determined that if Westcoast's proposed habitat compensation plan for HADD, is implemented that it would address DFO's No Net Loss policy regarding fish habitat. Once the terms and conditions of the plan have been agreed to, DFO would be in a position to issue a section 35(2) Authorization for the Project.

DFO stated in its 16 September 2002 letter[2] that fish habitat in the Wapiti River, Belcourt Creek and the Narraway River would be harmfully altered, disrupted or destroyed as a result of the construction of instream structures needed for temporary bridge crossings and that habitat compensation would be required. The potential need for habitat compensation measures is presented in Table 7-10. The actual habitat compensation measures are detailed in Westcoast's 3 June 2002 letter to DFO.

In addition, DFO would include its standard mitigations required for all pipeline crossings of fish bearing streams as well as any site specific measures and conditions, in any future letters of advice or Authorizations to the proponent.

7.3 Conclusions and Recommendations

The current design of the Project, the specific strategies and mitigative measures as outlined in Westcoast's application and subsequent filings and DFO's standard mitigation measures for pipeline crossings as well as any additional site specific measures imposed by DFO, will adequately mitigate environmental effects on fish and fish habitat.

Through the implementation of Recommendation 7, set out in section 15, the Board would require updated water course crossing drawings and updates to the stream crossing information in the EPP, to be filed with the Board prior to construction. These updates would encompass the requirements of DFO in any future authorization that it may issue in respect of the Project.

As the proposed winter construction schedule may conflict with the sensitive period for the fish species resident in some of the streams crossed by the Project, additional monitoring and follow-up on these streams is recommended as follows:

> ***Recommendation 2:***
>
> Westcoast shall file the following information, at least 14 days prior to the commencement of construction of any water crossing to be constructed during the closure window for fisheries:
>
> a) a water quality monitoring program to be undertaken immediately prior, during and after construction;
>
> b) a contingency plan detailing the criteria for any measures that would be implemented as a result of monitoring undertaken pursuant to paragraph (a); and
>
> c) evidence as to whether the Department of Fisheries and Oceans Canada (DFO) is satisfied with any programs derived pursuant to paragraph (a) and with the measures described in (b).

The Project is not likely to cause significant adverse environmental effects on fish or fish habitat if the mitigative measures outlined, and recommendations noted above, are implemented.

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[2] Comments provided pursuant to paragraph 16 of Amended Hearing Order and Directions on Procedure AO-02-GH-2-2002

Chapter 8

Vegetation

8.1 Westcoast Submission - Revised Draft CSR - 4 January 2002

8.1.1 Existing Conditions

The proposed Project is situated on the eastern slopes of the Rocky Mountains. The route crosses two biogeoclimatic zones, the Boreal White and Black Spruce (BWBS) zone and the Engelmann Spruce-Subalpine Fir (ESSF) zone. Approximately 75% of the pipeline route is within the BWBS biogeoclimatic zone. The proposed pipeline RoW crosses the Peace variant (BWBSmw1) in the larger valleys (7%), and the Murray variant (BWBSwk1) from the foothills to mid-slope on the Rocky Mountains (70%). The pipeline route also crosses lower elevations of the subalpine in the Engelmann Spruce-Subalpine Fir, Bullmoose variant (ESSFmv2).

The most common forest cover types in the area are lodgepole pine stands. White spruce are commonly associated with the pine on richer sites, and black spruce with the pine on poorer sites. At higher elevations, Engelmann spruce and subalpine fir also occur with lodgepole pine. The diverse terrain in the area supports a range of site series ecosystem units, from wetlands to dry crests, within each variant. The area of each site series represented in the Local Study Area (LSA) is presented in Table 8-3. A general discussion of site series ecosystem unit characteristics is presented in Appendix H of the Environmental Impact Assessment (EIA) (AXYS 2001a).

Forest fires are frequent throughout the BWBS zone, maintaining the forest in a variety of successional stages (DeLong, *et al.* 1991). The resulting natural landscape is a patchwork of even-aged stands of various seral stages. The majority of the forest cover in the area consists of young and mature forest.

At present forests in the region of the proposed Project are almost entirely first growth forests that have never been logged. There are large expanses of young and mature forest, fragmented in places by linear and non-linear disturbances. Anthropogenic disturbances in the area include roads, seismic lines, pipeline corridors and facilities, wellsites, airstrips and a few forestry cutblocks.

8.1.1.1 Uncommon Site Series

There are two uncommon site series in the LSA, BWBSwk1-02 and BWBSmw1-02. These site series occur on crests and forested ridges. Both are considered uncommon in their respective variants since this terrain feature occupies relatively small areas of the landscape.

8.1.1.2 Wetlands

Wetlands are defined as lands with subhydric or hydric soils, where water levels are high enough, for long enough periods of time, to create low oxygen conditions and resultant hydrophytic vegetation (Banner and MacKenzie 2000). There are five wetland types present in the Project area, all of which are organic peatlands.

Two of the wetland site series (BWBSmw1-08, BWBSWK1-07) are treed black spruce bogs, with poor to very poor nutrient regimes and wet, acidic soils. They occur in low areas in hummocky terrain and along broad valley bottoms in the LSA. Water regimes in bogs are fairly stable. The primary sources of water in bogs are from precipitation. They are relatively isolated from nutrient rich groundwater or runoff (Warner and Rubec 1997). Both site series are described as common components of their respective variants (DeLong *et al.* 1994).

Three of the wetland site series (BWBSwk1-08, BWBSwk1-00 and ESSFmv2-00) are treed fens. Fens are influenced by the lateral flow of groundwater found in surface drainages and groundwater seepages. The Black spruce – Willow – Glow Moss site series (BWBSwk1-08) typically has a rich nutrient regime and wet, organic soils. It is not very common as the BWBSwk1 variant is a montane boreal ecosystem with fewer flat areas that can develop into this unit. (C. DeLong, pers. comm.). This site series makes up 2.7% of the LSA (Table 8-3).

The Tamarack – (Black Spruce) – Water Sedge – Fen Moss association is found in both the BWBSwk1 variant and the ESSFmv2 variant. It is found in areas with significant water flow. The water table is high throughout the growing season (MacKenzie and Shaw 2000). The abundance of this site series in the BWBSwk1 is uncertain but likely uncommon (W. MacKenzie pers. comm.). This site series makes up 2.6% of the LSA. In the ESSFmv2 variant, the Tamarack – (Black Spruce) – Water Sedge – Fen Moss association occurs only in the lower portion of the variant near the boundary, where it is also likely to be uncommon (W. MacKenzie pers. comm.). It is represented in 0.8% of the LSA.

8.1.1.3 Old Growth Forest

The Biodiversity Guidebook (Ministry of Forests 1995) describes the Murray and Peace variants of the Boreal Black and White Spruce zone (BWBS) as forests as having frequent stand-initiating events. The mean fire return interval is about 125 years in coniferous forests. The resulting natural landscape is a patchwork of even-aged stands of various seral stages. In the LSA 35% of the forests are young forests (structural stage 5) and 36% are mature forests (structural stage 6) (see Figure 8-1 for distribution of structural stages in the LSA). Mature forests are defined as >100 years old and old growth (structural stage 7) is defined as >140 years old.

The Engelmann Spruce-Subalpine Fir zone, Bullmoose variant (ESSFmv2) is an ecosystem with infrequent stand-initiating events. This higher, cooler area has a wetter climate and terrain features that give some protection from fire. The natural disturbance interval is estimated to be 200 years (Ministry of Forests 1995). In the ESSF zone mature forests are defined as > 120 years old and old growth is defined as > 250 year old. The undisturbed landscape is typically large areas of even-aged forests with small patches and individual veterans of the last disturbance event. The main disturbance types in all the variants in the study area are fire and wind, with minor environmental effects from landslides and insects.

Old growth forest (structural stage 7) occurs in several site series in the study area. For the purposes of this study, a conservative age for old growth of 140 years for the entire LSA was used, rather than using 250 years in the ESSF variant, because many of the vegetation polygons are transitional between the ESSFmv1 variant and the BWBSwk1 variant. The pipeline route only encounters the lower elevations in the ESSF. On this basis 7% of the forests in the LSA are old growth forests.

8.1.1.4 Rare Plant Communities

Several rare plant communities are represented in the Dawson Creek Forest Region and on the eastern slopes of the Rocky Mountains in Alberta. They are described in the EIA, Section 5.1.1.3 (AXYS 2001a). No rare plant communities were observed on the RoW or adjacent to the right of way during the 2001 rare plant field surveys. Therefore, they are dropped from further consideration in this assessment.

8.1.1.5 Rare Plants

Rare plant surveys were conducted on the proposed RoW and in sensitive areas (such as wetlands) immediately adjacent to the right -of-way in June and again in August 2001. Six occurrences of rare plant species were found on the RoW; one of sheathed cotton-grass (*Eriophorum vaginatum* ssp. *Vaginatum*), one of spike redtop (*Agrostis exarata*), and two each of northern bog bedstraw (*Galium labradoricum*) and hairy butterwort (*Pinguicula villosa*) (Rare Plant Survey, Mitigation and Monitoring Report for the Grizzly Extension Pipeline, AXYS 2001d). The spike redtop was found along the Narraway River and the other species were found in bogs near the west end of the pipeline route.

8.1.2 Assessment Approach

8.1.2.1 Selection for Vegetation Environmental Components of Concern

The selection of Valued Environmental Components (VECs) for the Grizzly Extension Pipeline is based on vegetation component rarity and sensitivity to disturbance. Rarity is a measure of relative abundance. For rare plant species the provincial designation is considered. For vegetation site series, wetlands, and old growth, the abundance in the LSA is considered as well as the abundance in the region, based on the "Field Guide for Identification and Interpretation of Ecosystems of the Northeast Portion of the Prince George Forest Region" and the "Field Guide to Ecosites of West-central Alberta" where applicable. Sensitivity to disturbance considers the ability of the vegetation component to reclaim, either naturally or with assistance over a period of time. Vegetation ecosystem components selected as VECs include:

- Uncommon vegetation site series;
- Wetlands;
- Old growth forest; and
- Rare plants.

8.1.2.2 Boundaries

8.1.2.2.1 Spatial Boundaries

Two defined study areas were used to determine effects to vegetation resources:

- The Project footprint; and
- The Local Study Area (LSA).

The Project footprint (the RoW and anticipated extra workspace) was used to assess the environmental effect of Project development on rare plants and rare plant communities. Field surveys for rare plants and rare plant communities were conducted on the proposed project footprint and in sensitive areas immediately adjacent to the footprint.

The Local Study Area (LSA), a 2 km wide corridor centred on the proposed pipeline alignment, was used to assess environmental effects of project development on site series vegetation, wetlands and old growth. Terrestrial ecosystem mapping and field surveys in support of Biogeoclimatic Ecosystem Classification (BEC) site series classification were conducted in the LSA corridor. This study area provides a very conservative estimate of the environmental effects of the Project as the LSA represents a thin ribbon through more broadly dispersed vegetation communities. Existing disturbance in the LSA is proportionately higher than the general region as the pipeline was routed to follow existing disturbed corridors as much as possible.

No defined regional assessment area with discrete boundaries was used for assessing environmental effects to vegetation resources. Information on regional biophysical and land use resources was drawn from existing work including the Dawson Creek Land and Resource Management Plan (LRMP), BC Ministry of Forests field guides for the biogeoclimatic ecosystem variants, Alberta and BC regional databases and other references.

Regional information on rare plants and rare plant community occurrences was obtained from the BC Conservation Data Centre (BC CDC) for the Dawson Creek Forest District for the BC portion of the route. In Alberta, information on rare plant and rare plant community occurrences in the region was obtained by querying the Alberta Natural Heritage Information Centre (ANHIC) database. Since this area of the eastern slopes of the Rockies has little information available on potential rare plants, the search area for rare plant occurrences was extended south along the front ranges in similar habitats. The search area was designed to capture information on potential species in the habitats present along the pipeline alignment. The search area included: Townships 59 to 64, Ranges 8 to 13, W6M; Townships 56 to 61, Ranges 1 to 7, W6M; and Townships 24 to 26, Ranges 56 to 61, W5M.

The ANHIC Preliminary Plant Community Tracking List (ANHIC 2000) and the BC CDC Rare Natural Plant Community Tracking List – Dawson Creek Forest District databases were checked to provide information on rare, restricted, or declining plant communities that may occur in the region.

8.1.2.3 Temporal Boundaries

To assess Project-specific environmental effects, four assessment periods were used, baseline, peak construction, operations and maintenance and decommissioning. For cumulative environmental effects assessment an additional assessment time period, pre-development, was included.

Predevelopment

Predevelopment represents a best estimate of potential vegetation cover under present day conditions with all visible human disturbance lifted from the landscape. Likely vegetation conditions estimated for existing disturbed areas are extrapolated from adjacent undisturbed areas.

Baseline

Present day, pre-construction habitat conditions are used as a basis to evaluate the environmental effects of the Project during all phases.

Construction and Commissioning

Construction of the Project is anticipated to occur in two phases over a ten month period from period from summer 2002 to late winter 2003. This period includes the time to construct barriers to access, complete reclamation seeding and a short period following construction to allow for erosion control measures to become established along the RoW.

Operation and Maintenance

The operational life of the Project is estimated to be approximately 40 years.

Decommissioning and Abandonment

For the purpose of this CSR, decommissioning is assumed to commence at some time after 40 years of pipeline operation.

8.1.2.4 Analytical Techniques Used to Characterize Environmental Effects

8.1.2.4.1 Ecosystem Classification

An adapted form of the Biogeoclimatic Ecosystem Classification (BEC) system has been used to form the framework for assessing the environmental effects of the proposed development on terrestrial ecosystem components. The BEC system classifies ecosystems in a hierarchical form by climate, vegetation and site characteristics. The ecosystem can then be described as a complex of site series units. A description of the BEC system is presented in the EIA Section 7.1.1.1 (AXYS 2001a). Structural stage of the site series was also included as a descriptor for the analysis. The structural stage of vegetation communities is an important influence on the occurrence many species of wildlife, rare plants and rare communities. Collection of structural stage information also allowed for the determination of areas of old growth.

The basis for the mapping is a terrain ecosystem map based on surface landforms. Terrain Ecosystem Mapping (TEM) is described in Section 7.1.1.1 of the EIA (AXYS 2001a). The site series/structural stage units found within the terrain polygons are then described in terms of percentage cover within the terrain polygon. This information is catalogued in the GIS database and forms the basis for the environmental effects analysis. The TEM classification system is used on both Alberta and BC portions of the Project for consistency. The final map is used for describing vegetation cover, applying habitat evaluation models for a variety of wildlife species, and for evaluating which site series units are uncommon in the area. Field surveys to collect data with which to classify site series occurred September 21 to 28, 2000. Survey details are presented in the EIA Section 7.1.1.2 (AXYS 2001a). An additional field survey was conducted on the reroute at Gunderson Creek on September 27, 2001.

8.1.2.4.2 Project Environmental Effects on Vegetation Site Series

Since the EIA was filed in January 2001, a number of amendments to the initial routing have been made. In light of these changes the analysis of environmental effects to site series vegetation has been re-evaluated. A brief discussion of environmental effects associated with the refined pipeline alignment (November 2001) is presented.

8.1.2.4.3 Rare Plant Communities

Preliminary tracking lists for rare plant communities have been developed for Alberta and British Columbia. These databases (EIA Appendix E, AXYS 2001a), the ANHIC Preliminary Plant Community Tracking List (ANHIC 2000) and the BC Conservation Data Centre: Rare Natural Plant Community Tracking List – Dawson Creek Forest District, were checked to provide information on rare, restricted, or declining plant communities that may occur in the study area. A field survey for rare plant communities was undertaken during late spring of 2001. Potential rare plant communities were identified prior to field surveys through map and air photo interpretation and by gathering information on associated landscape features. No rare plant communities were found during surveys of the pipeline RoW and sensitive communities adjacent to the RoW. Therefore, rare plant communities are not considered in further analysis.

8.1.2.4.4 Rare Plants

Provincial tracking lists for rare vascular plants are maintained by the ANHIC and by the BC CDC. Rare plant field surveys were conducted in June and August 2001 along the proposed route and in sensitive areas adjacent to the route (areas where environmental effects on the RoW may extend beyond the RoW, *e.g.*, alteration of wetland water regimes). Background data was compiled prior to field surveys in order to assess the potential for rare plant species occurrences within the Project area. Survey methods followed those described in the Alberta Native Council Guidelines for Rare Plant Surveys (Lancaster 2000). Rare plant occurrences were documented during surveys conducted in the Project footprint area in June and August 2001.

8.1.2.5 Weeds and Non-native Species

Occurrences of weeds and other invasive, non-native plant species were recorded during ground-based BEC field surveys in late September 2000, but no specific weed surveys have been undertaken. No problem species were observed other than ubiquitous introduced species used in forestry mixes such as Timothy, smooth brome, crested wheatgrass, clover and alfalfa. These species are common on existing rights-of-way and in road ditches.

8.1.3 Residual Environmental Effects Rating Criteria

The significance of environmental effects on vegetation was assessed by considering the nature of potential environmental effects, the mitigative strategies that are available for reducing or eliminating such environmental effects, and the nature and anticipated severity of residual environmental effects after mitigation.

The ability to quantitatively determine the potential significance of project-related environmental effects on vegetation VECs requires the ability to compare assessment results with ecological thresholds and policy objectives for a given VEC. However, ecological thresholds have not been developed for most biological populations, including rare plants, uncommon site series, wetlands and old growth forests. In areas intersected by the proposed pipeline in both Alberta and British Columbia there are no adopted standards for any of the vegetation VECs. In the absence of these criteria a qualitative approach has been adopted based on subjective determinations of environmental effect attributes and best professional judgment. Attributes used to describe residual environmental effects are presented in Table 8-1.

Table 8-1
Environmental Effect Attributes for Vegetation VECs

Attribute	Options	Definition
Direction	Positive Neutral Negative	Beneficial environmental effect on vegetation VEC No change to vegetation VEC Adverse environmental effect on vegetation vec
Scope	Local Regional	Effect restricted to the Project footprint or periphery Effect within or extending beyond the LSA
Duration [1]	Short-term Medium-term Long-term	Effects persist for less than three years Effects persist for one generation (80 years based on forest regeneration) Effects persist for more than one generation
Magnitude [1]	Low Moderate High	Residual environmental effects will represent < 5% change in the resource from baseline conditions in the LSA. Residual environmental effects will represent 5 – 10% change in the resource from baseline conditions in the LSA. Residual environmental effects will represent > 10% change in the resource from baseline conditions in the LSA.

[1] In the absence of identified thresholds, quantitative measures of both duration and magnitude were used only as guides in the characterization of environmental effects.

8.1.3.1 Other Considerations in the Evaluation of Significance

8.1.3.1.1 Old Growth Forest

Site characteristics and the historic absence of natural disturbances such as wind, disease, landslides and fire influence the formation of Old Growth Forest associations. Losses of old growth communities cannot predictably be replaced and are considered permanent losses.

8.1.3.1.2 Rare Plants

Rare plants are by definition rare on the landscape level and/or may have very few individuals. No thresholds are available for losses to rare plant populations, however the generally accepted rule of thumb for collecting is to collect no more than 1 in 20 plants (5% of the population). While it has not been rigorously tested in terms of whether a 5% loss of a rare plant population will affect population viability, this proportion in terms of acceptable direct mortalities for collection has been independently proposed by several groups of botanists (Wagner 1995). In the absence of studies that have determined acceptable levels of loss in rare plant populations this figure has been adopted as a measure of significance.

The level of confidence for predicting Project-related environmental effects on rare plants, and effectiveness of mitigation techniques is low, so significance is estimated on the actual loss of individuals. Significant environmental effects are those that result in:

a loss of greater than 5% of a plant population with a rarity ranking of SI; or
a loss of an entire population (discrete grouping of individuals separated geographically from other assemblages by habitat or other factors) of an S1 or S2 rare plant; or
a loss of individuals of a G1 to G3 globally rare species.

Definitions of rarity ranks are summarized below.

Alberta and BC Conservation Data Centre (CDC) Rare Plant Ranking		
Provincial Rank	**Global Rank**	**Definition**
S1	G1	Critically imperiled provincially/globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction. Typically 5 or fewer occurrences or very few remaining individuals (<1,000).
S2	G2	Imperiled provincially/globally because of extreme rarity or because of some factor(s) making it especially vulnerable to extinction. Typically 6 to 20 occurrences or few remaining individuals (1,000 to 3,000).
S3	G3	Vulnerable provincially/globally either because very rare and local throughout its range, found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extinction. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals
S4	G4	Uncommon but not rare, and usually widespread. Possibly cause for long-term concern. Typically more than 100 occurrences provincially/globally or more than 10,000 individuals.
S5	G5	Common, typically widespread and abundant.
SH = Possibly Extirpated		Known only from historical occurrences. Still some hope of rediscovery.
The provincial rank will always be less than or equal to the global rank. An element cannot be given a provincial rank that indicates it is more common locally than globally.		

8.1.4 Environmental Effects Analysis

8.1.4.1 Potential Interactions

Potential environmental effects to vegetation resources by project development are as follows:

changes in the structure and composition of vegetation;
changes in abiotic site conditions (soil structure, drainage); and
loss of vegetation.

The timing and nature of the Project-related environmental effects during the various phases of the Project are presented in Table 8-2.

8.1.4.1.1 Construction and Commissioning

During the construction phase of the Project forest and shrub vegetation will be cleared from the RoW, work areas and construction phase access roads, commencing summer, 2002. Stripping of the ditch area and the work side will then proceed with salvage of organic material or the upper soil horizons. Stripping will not occur under the spoil storage area except where grading is necessary. Construction of Phase 2 will occur during frozen ground conditions to reduce potential for environmental effects on wetlands. In areas where construction will occur in frozen ground conditions RoW stripping will be restricted to trenching on the ditchline except where grading is required. Losses of vegetation will occur wherever clearing or stripping occurs. In areas where surface organic soils have developed, soil fertility will be reduced by admixing of soil layers, affecting vegetation recovery (Gerling *et al.* 1996).

Table 8-2
Project Phase Activities and Potential Environmental Effects to Vegetation

Project Phase	Project Activity	Potential Environmental Effect
Construction and Commissioning	RoW preparation	Loss of vegetation Change in abiotic site conditions for vegetation development
	Clean-up and Reclamation	Changes in abiotic site conditions for vegetation development Changes in structure and composition
Operation and Maintenance	Mechanical Vegetation Control	Loss of vegetation Changes in structure and composition
	Herbicide Application	Loss of vegetation Changes in structure and composition
Decommissioning and Abandonment	Reclamation of above ground facilities. Discontinuation of vegetation management on the RoW	Recovery of vegetation
Accidents, Malfunctions and Unplanned Events	Pipeline Leak/Rupture	Loss of vegetation Changes in structure and composition
	Forest Fire	Loss of vegetation Changes in structure and composition

Wetland drainage patterns can potentially be affected during construction by the presence of the pipe in the ground, corduroy and grade material left in wetlands. Since the wetlands on the alignment do not have standing surface water, no drainage of wetlands (through pumping) will occur during construction.

Introduction of reclamation grasses on the RoW can also affect vegetation resources by introducing new species onto a site. Grasses can also outcompete tree and shrub seedlings on a site (Gerling *et al.* 1996).

8.1.4.1.2 Operation and Maintenance

The primary environmental effects to the reclaiming RoW during the operation and maintenance phase of the Project are typically from vegetation control measures. Apart from selected areas (vegetation blocks for access control and habitat provisions), the right of way will be kept clear of woody vegetation. Herbicide applications may occur as part of the ongoing noxious weed management (EPP Section 4.3.4). In sensitive areas near wetlands, riparian areas and rare plant sites, mechanical vegetation control measures will be used.

8.1.4.1.3 Decommissioning and Abandonment

Unless pipe or facilities are removed from the ground as part of decommissioning, no environmental effects to vegetation are anticipated other than the positive environmental effects of shrubs and trees re-establishing as vegetation management programs are terminated.

8.1.4.1.4 Accidents, Malfunctions and Unplanned Events

Accidents, malfunctions and unplanned events that could affect vegetation include fire, pipeline leaks or ruptures and spills. An emergency response plan would not be required to protect vegetation VECs in the event of natural events like fire. Sour gas releases are unlikely to have serious environmental effects on vegetation in the short term. Pipeline leakage or rupture, and maintenance activities required to repair them, may pose risks to vegetation resources, but the probability of such upset events affecting VECs is very low.

Changes to natural fire frequency or characteristics are not expected from construction of the pipeline. Fire paths should not be altered by the narrow RoW. Hence the RoW is not expected to interfere with ecosystem processes associated with wildfire.

8.1.4.2 Overview of Project and Cumulative Environmental Effects on Vegetation

8.1.4.2.1 Project Environmental Effects on Vegetation Site Series

The overall environmental effect of the Project on vegetation site series was updated based on the current refined pipeline routing. An estimated 159.7 ha of previously undisturbed land will be cleared for the proposed pipeline development. The pipeline RoW will overlap approximately 30 ha of existing disturbance. Less than 2.2% of each of the site series in the LSA will be affected by the Project (Table 8-3). All the site series are common in the LSA with three exceptions, BWBSwk1-02, BWBSmw1-02 and BWBSmw1-04 (Table 8-3). Refer to Section 8.1.4.3 for further discussion.

Localized alteration and loss of vegetation as a result of pipeline construction is unavoidable. However, protection and reclamation measures will be adopted to minimize the alteration or loss of vegetation features on the landscape, and to enhance re-establishment of vegetation communities following construction. Briefly, the following general mitigative strategies will apply:

- Where the proposed project follows existing rights-of-way or roads, it may be possible to use existing clearings for temporary workspace, there by reducing clearing requirements for workspace.
- Reclamation strategies will be developed to enhance natural vegetative recovery on construction access roads.
- Native seed mixes will be used to reseed the RoW.
- Weed control measures will be undertaken along the RoW on an as required basis.

Mitigation and protection planning information is supplemented by the more detailed information provided in the EPP.

The majority of clearing for the pipeline will occur in well represented vegetation communities through the study area and the region. The incremental clearing that is required for the proposed project will not jeopardize the relative abundance, diversity or sustainability of these communities. Environmental effects on these widespread communities are considered negative, localized, long-term events of low magnitude. Therefore the Project-related environmental effect on common site series vegetation is considered not significant.

8.1.4.2.2 Cumulative Environmental Effects on Vegetation Site Series

Clearing and grading activities associated with pipeline construction represent a change in vegetation characteristics. This disturbance represents an additive environmental effect that combines with other surface disturbances in the Project area. Extensive alteration within a given site series can potentially result in a reduction in botanical biodiversity within the LSA, particularly if an individual species or a group of species is only associated with that site series. The assessment has evaluated the the significance of incremental disturbance from the proposed development in the context of this existing disturbance.

Table 8-3
Estimated Environmental Effects to Site Series from Project and Existing Disturbances Compared to the Pre-development Scenario

Site Series	Pre-Disturbance Area			Disturbance at Baseline		Pipeline Construction Disturbance		Pipeline Construction + Baseline Disturbance	
	ha	% of BGC Variant	% of LSA	ha	% of Site Series	ha	% of Site Series	ha	% of Site Series
BWBSmw1 - Boreal Black and White Spruce - Peace Variant									
01	898.9	47.5	3.8	13.9	1.5	8.9	1	22.4	2.5
02	17.7	0.9	0.1	0.0	3.9	0.7	0.0	0.7	3.9
03	282.6	14.9	1.2	4.4	1.6	1.5	0.5	5.7	2
04	18.6	1.0	0.1	0.1	0.4	0.4	2.1	0.5	2.6
06	110.3	5.8	0.5	0.5	0.4	0.1	0.1	0.6	0.5
07	341.2	18.0	1.4	5.1	1.5	3.6	1.0	8.5	2.5
08	221.4	11.7	0.9	0.8	0.4	1.6	0.7	2.5	1.1
BWBSwk1 - Boreal Black and White Spruce - Murray Variant									
00	616.2	3.7	2.6	19.2	3.1	5.0	0.8	23.7	3.8
01	4996.7	30.3	21.2	114.1	2.3	36.9	0.7	146.6	2.9
02	127.3	0.8	0.5	6.9	5.4	1.4	1.1	8.2	6.4
03	5393.3	32.7	22.9	263.9	4.9	55.3	1.0	307.1	5.7
04	2489.7	15.1	10.6	188.2	7.6	10.4	0.4	196.9	7.9
05	808.0	4.9	3.4	42.2	5.2	4.0	0.5	45.4	5.6
06	702.4	4.3	3.0	31.5	4.5	5.7	0.8	36.5	5.2
07	715.2	4.3	3.0	26.9	3.8	4.2	0.6	30.7	4.3
08	624.8	3.8	2.7	26.5	4.2	5.2	0.8	31.4	5.0
ESSFmv2 - Engelmann Spruce - Subalpine Fir - Bullmoose Variant									
00	186.1	3.6	0.8	2.8	1.5	1.6	0.8	4.3	2.3
01	1734.6	33.4	7.4	86.4	5.0	10.3	0.6	95.3	5.5
02	493.1	9.5	2.1	44.1	8.9	7.9	1.6	49.2	10.0
03	2232.2	43.0	9.5	65.4	2.9	23.6	1.1	85.4	3.8
04	94.6	1.8	0.4	3.7	3.9	0.0	0.0	3.7	3.9
05	188.4	3.6	0.8	2.6	1.4	0.8	0.4	3.3	1.8
06	126.5	2.4	0.5	1.1	0.8	1.0	0.8	1.9	1.5
07	130.0	2.5	0.6	2.1	1.6	0.2	0.2	2.3	1.7

Note 1: Site series 00. has not been given a number yet by the Ministry of Forests. It is described in MacKenzie and Shaw 2000.

At baseline, (prior to development of the proposed Project) approximately 4.0% (952.8 ha) of the LSA (*i.e.*, 2 km corridor) has been modified by human activity, with 96.0% supporting relatively undisturbed vegetation cover. Disturbances include roads, cutlines, industrial sites, borrow pits, clearcuts, and airstrips. Disturbances have occurred in all site series in the study area, ranging from a low of 0.4% loss to a high of 8.9% loss of site series ESSFmv2-02 (Table 8 -3). At baseline, disturbance levels in the LSA are already moderate in magnitude (5-10%) in five site series in the LSA. These are BWBSwk1-02 (5.4%), BWBSwk1-04 (7.6%), BWBSwk1-05 (5.2%), ESSFmv2-01 (5.0%) and ESSFmv2-02 (8.9%).

After completion of Project construction, an additional 0.7% (159.7 ha) of the LSA will have been modified by human disturbance, leaving 95.3% remaining vegetation cover undisturbed. Disturbance due to pipeline construction adds less than 2.1% disturbance to each site series represented in the LSA. However, incremental disturbance levels in two site series could potentially become moderate in magnitude with the construction of the pipeline. They are BWBSwk1-06 (White spruce – Currant – Horsetail), and BWBSwk1-08 (Back spruce – Willow – Glow moss) (Table 8-3). The resulting estimates of surface disturbance are 5.7% (up from 4.9%) and from 5.2% respectively (up from 4.5%).

At present forests in the region are almost entirely first growth forests. Anthropogenic disturbances in the area including this project development will amount to 4 % affect on the LSA. The Project-related environmental effect has an incremental nibbling effect of 0.8% on the magnitude of the environmental effects in the area. However, the LSA represents a thin ribbon through more broadly distributed vegetation communities in the region. In addition, the LSA may over estimate existing disturbances as the pipeline has been routed to follow existing disturbances as much as possible. Measuring environmental effects in this corridor presents a very conservative estimate of the environmental effects of the Project. Although the cumulative environmental effects to a number of site series are moderate in magnitude in the context of the LSA (Table 8-3) these numbers are indicators rather than strict thresholds. Though the environmental effects from clearing represent a long-term, measurable change, they are likely to be assimilated by the ecosystem through natural successional patterns, depending on land management practices. With the implementation of mitigation measures discussed, the incremental disturbance to common site series is considered a not significant cumulative environmental effect.

8.1.4.3 Project and Cumulative Environmental Effects on Uncommon Site Series

There are two uncommon site series in the LSA, BWBSwk1-02 (0.8% of the variant in the LSA) and BWBSmw1-02 (0.9% of the variant in the LSA. These site series occur on crests and forested ridges. Both are considered uncommon in their respective variants since this terrain feature occupies relatively small areas of the landscape. At baseline, environmental effects to 3.9% of the BWBSmw1-02 site series and 5.4% of the BWBSwk1-02 site series have already occurred in the LSA.

Affects from Project-related clearing are predicted to contribute incremental environmental effects on 0.7 ha (0.003%) of the BWBSmw1-02 site series (Table 8-3). Environmental effects from clearing are predicted to contribute incremental environmental effects on 1.4 ha (1.1%) of the BWBSwk1-02 site series (Table 8-3). Some grading in these site series will be unavoidable even with mitigation, as the pipeline crosses crests of hills along the route.

Use of temporary workspace will be avoided or minimized where possible to reduce environmental effects to the uncommon site series. Minimal grading will occur wherever practical to minimize surface disturbance in cleared areas. Physical site conditions associated with these site series, a sub-xeric moisture regime and poor to very poor nutrient regime, are unlikely to change significantly as a result of construction.

Environmental effects of the Project on uncommon site series BWBSmw1-02 are negative, localized, long-term, reversible event of low magnitude. Combined environmental effect of the Project and baseline environmental effects are considered not significant.

Losses of 5.4% of site series BWBSwk1-02 at baseline have already occurred. The environmental effect of RoW construction in this site series is considered to be a reversible event that will last more than one generation. Incremental environmental effects due to project development are considered to be a negative, localized, long-term, reversible event of low magnitude. There will be a small incremental contribution by the Project (*i.e.*, 1.1%) to existing cumulative environmental effects to this VEC in the LSA. Again, it should be recognized that the LSA is an narrow 2 km-wide corridor adopted for vegetation characterization purposes only with no ecological significance. Although the BWBSwk1-02 site series has experienced adverse environmental effects within the LSA, it is well represented on crests and forested ridges in adjacent areas. Therefore the cumulative environmental effects to this VEC are considered to be not significant.

8.1.4.4 Project and Cumulative Environmental Effects on Wetlands

The five wetland types present in the LSA are all treed fens or treed bogs with little to no standing surface water. They account for 10% of the LSA (Table 8-4). Information on the regional abundance of wetland site series has been gathered from BC Ministry of Forests publications and through communications with Ministry of Forests staff. The Tamarack – (Black Spruce) – Water Sedge – Fen Moss association occurs in the BWBSwk1 and the ESSFm2 variants. The distribution is uncertain but likely uncommon in both variants (W. MacKenzie pers. comm.). The Black spruce – Willow – Glow Moss site series (BWBSwk1-08) fen type is also not very common (C. DeLong, pers. comm.).

Table 8-4
Wetland Site Series in the LSA That Will be Affected by Pipeline Construction

Site Series	Pre-Disturbance Area			Disturbance at Baseline		Pipeline Construction Disturbance		Pipeline Construction + Baseline Disturbance	
	ha	% of BGC Variant	% of LSA	ha	% of Site Series	ha	% of Site Series	ha	% of Site Series
BWBSmw1-08	221.4	11.7	0.9	0.8	0.4	1.6	0.7	2.5	1.1
BWBSwk1-00[1]	616.2	3.7	2.6	19.2	3.1	5.0	0.8	23.7	3.8
BWBSwk1-07	715.2	4.3	3.0	26.9	3.8	4.2	0.6	30.7	4.3
BWBSwk1-08	624.8	3.8	2.7	26.5	4.2	5.2	0.8	31.4	5.0
ESSFmv2-00[1]	186.1	3.6	0.8	2.8	1.5	1.6	0.8	4.3	2.3
Total	2363.5		10.0	76.3		17.6		92.6	

Note 1: Site series 00, has not been given a number yet by the Ministry of Forests. It is described in MacKenzie and Shaw 2000.

At baseline there have been environmental effects to 3.2% of the wetland areas in the LSA, with losses in each site series not greater than 4.2%. Anticipated direct losses due to project construction are presented in Table 8-4. Less than one percent of each wetland site series will be directly affected by Project construction. There will be 1.3 ha of overlap between existing and new disturbance.

Potential environmental effects to wetland ecosystems from project construction include direct vegetation losses, peat and soil removal on the Project footprint and environmental effects to wetland hydrology both on and beyond the Project footprint. Since the lateral movement of water influences the hydrodynamics of fens, alterations to water movement by construction can affect wetland areas beyond the Project footprint.

Mitigation measures for environmental effects to wetlands include construction in frozen ground conditions where possible, trench width ditching, salvage of organic materials and use of log corduroy or swamp mats to help support construction vehicles and buffer the surface from environmental effects. Corduroy or temporary roadbed material will be removed as required during clean-up to restore drainage patterns and minimize environmental effects to sub-surface flows during clean-up. Dewatering of wetlands will not occur during construction of the Project. Salvaged organic matter will be replaced as the top layer during backfill operations and no reclamation seeding will occur.

Plant community re-establishment and succession occurs naturally over time (Banner and MacKenzie 2000). Residual environmental effects from the presence of the pipe in the wetland may occur but are difficult to quantify. Wetlands do naturally undergo succession and can evolve in response to hydrological disturbances (Banner and MacKenzie 2000), although the site potential may be altered. Blockages to water flow dynamics in wetlands can affect wetland function both on and beyond the RoW. Corduroy will be removed from the wetland after construction to minimize environmental effects to sub-surface water flow. Wetland contours will be re-created and breaks will be left in the roach.

Losses of 3.2% in wetland site series at baseline have already resulted in a negative, long-term environmental effects of low magnitude. The environmental effects of RoW construction in these site series is considered to be a reversible event that will last more than one generation. Incremental environmental effects due to project development are considered to be a negative, localized, long-term, reversible event of low magnitude. There will be a small incremental contribution by the Project to an existing low magnitude environmental effects to wetland site series in the LSA. Project-related and cumulative environmental effects are considered to be not significant

8.1.4.5 Project and Cumulative Environmental Effects on Old Growth

The age distribution of vegetation communities in the LSA is illustrated in Figure 8-1. The majority of the forests in the LSA are undeveloped first growth stands of young and mature forests. Old growth stands are estimated to occupy 1594.9 ha (6.8%) of the LSA in the pre-development scenario and 1547.7 ha (6.7%) at baseline. Environmental effects from clearing will occur in 13.6 ha (0.9%) of old growth stands in the LSA during construction. Figure 8-2 illustrates the representation of old growth stands in each site series in the LSA, and the distribution of losses that will occur during construction. Losses will occur in seven of the eleven site series that support old growth. These losses are less than 0.3% percent of the old growth stands in each site series. Project-specific losses of old growth total 0.9% of the old growth present in the LSA.

Figure 8-1
Distribution of Stand Ages for Pre-development, Baseline and Construction Scenarios

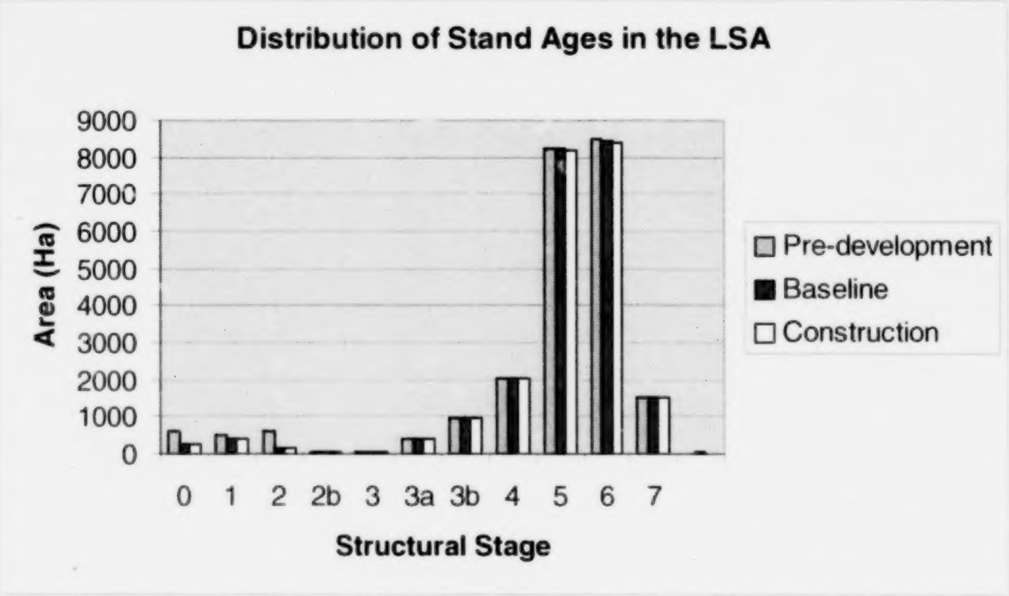
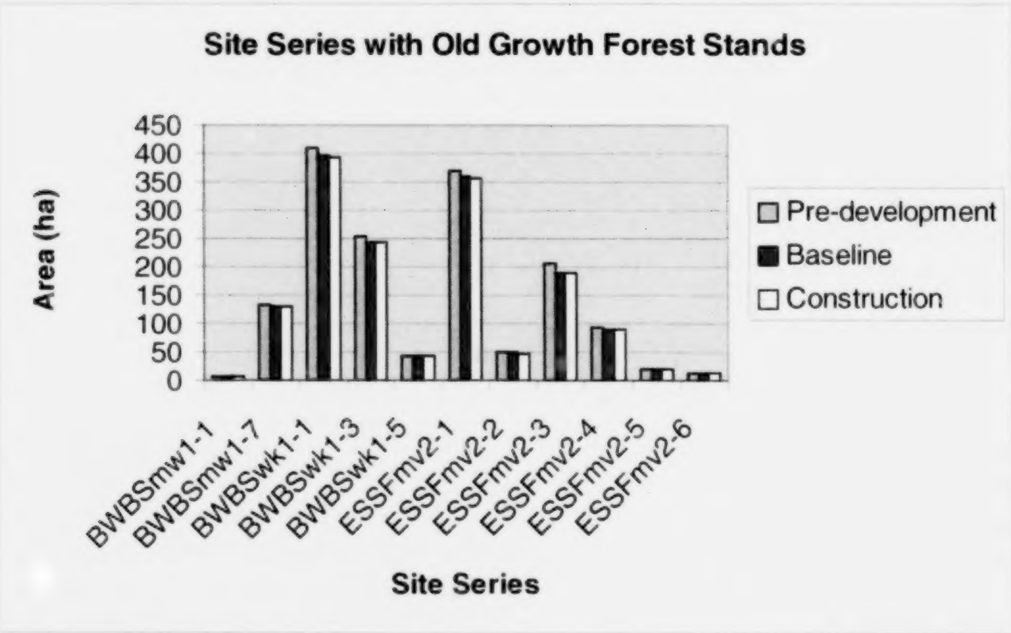


Figure 8-2
Distribution and Area of Old Growth in Site Series for Pre-development, Baseline and Construction Scenarios



Mitigation for old growth stands is avoidance. Use of temporary workspace will be avoided or minimized where possible in old growth stands to reduce environmental effects on this VEC. Old growth stands intercepted by the RoW are identified on the Environmental Alignment Sheets (Appendix C of the Westcoast Revised CSR, 4 January 2002). Some clearing and grading in old growth site series will be unavoidable. Project environmental effects on the old growth resource are considered to be a negative, local, long-term, irreversible event of low magnitude. These losses are considered not significant.

The Project occurs within a region that has experienced low to moderate levels of multiple land use developments and is designated as a general resource management area (Dawson Creek LRMP 1999). No guidelines or objectives for retention of old growth have been set for the region in either Alberta or BC. Ninety-six percent of the old growth resource in the LSA will remain unaffected by the cumulative environmental effects of existing activities in the region and project construction. Combined environmental effects from pipeline construction and baseline disturbance result in 3.8% loss of old growth from the pre-development scenario within the LSA. Losses of old growth from specific site series will be less than 1% in all cases. Losses of old growth from the various site series will not alter the proportional representation of old growth in the LSA (Figure 8-2). There will be a small incremental contribution by the Project to an existing irreversible, localized event of low magnitude environmental effects to old growth stands in the LSA. Project-related and cumulative environmental effects to old growth are considered to be not significant.

8.1.4.6 Project-related Environmental Effects on Rare Plants

Rare plants are not considered for cumulative environmental effect assessment (refer to Section 5.1.4.3).

Adverse Project-related environmental effects are not anticipated for species that have been observed growing on existing rights-of-way such as Sheathed cotton-grass and northern bog bedstraw (refer to Rare Plant Survey, Mitigation and Monitoring Report – AXYS 2001d). These species have been observed to recover from environmental effects in one generation or less (medium-term duration). Environmental effects are also not anticipated for species that colonize disturbances including the Sitka columbine and spike redtop. These species have been observed to recover from environmental effects in a few years (short to medium-term duration). These plants were largely eliminated from the proposed RoW by flooding events on the Narraway River between the spring and summer survey. Environmental effects from Project development on these species are anticipated to be not significant.

Hairy butterwort was only observed in undisturbed habitat under a black spruce canopy in a bog. The locations are marked on the Environmental Alignment Sheets (Appendix C of the Westcoast Revised CSR, 4 January 2002). It was not observed on an adjacent RoW. Given the poor nutrient conditions in bogs it may take some time to re-establish or it may not re-establish until a canopy is re-established. However, this plant was observed both on the proposed RoW and well off the RoW in suitable habitat. Given that much of the population is being avoided by narrowing the RoW, and that provincially the status is close to 20 populations in size in BC (S2S3 rarity ranking), no significant project-related environmental effects are anticipated.

8.1.5 Monitoring and Follow-up

8.1.5.1 Rare Plant Monitoring

A rare plant monitoring program will take place to observe the effectiveness of mitigation for each rare plant species. Field botanists will revisit all the rare plant sites affected by the constructed RoW in year 2 and year 3 following construction, to determine whether or not the rare plants are re-establishing on the RoW. This includes sites for the following species; Sheathed cotton-grass (*Eriophorum vaginatum* ssp. *vaginatum*), northern bog bedstraw (*Galium labradoricum*) and hairy butterwort (*Pinguicula villosa*. Plants in the area of the proposed aerial crossing of the Narraway River will be monitored if they are affected. They include Sitka columbine (*Aquilegia formosa*) and spike redtop (*Agrostis exarata*). The golden carpet (*Chrysosplenium iowense*) site was avoided as a result of a reroute and will not be monitored. Further discussion of rare plant monitoring can be found in the Rare Plant Survey, Mitigation and Monitoring Report for the Westcoast Grizzly Extension Pipeline (AXYS 2001d).

8.1.6 Summary of Residual Project-incremental and Cumulative Environmental Effects

At present forests in the region traversed by the proposed Project are almost entirely first growth forests. he Project occurs within a region that has experienced low to moderate levels of multiple land use developments and is designated as a general resource management area in BC (Dawson Creek LRMP 1999). Though the Project-related environmental effects represent a long-term, measurable change, they are local in scope and likely to be assimilated by the ecosystem through natural successional processes over time (Table 8-5). With the implementation of mitigation measures discussed, the negative environmental effects of the Project to vegetation VECs is considered not significant.

Table 8-5
Project Residual Environmental Effects and Their Attributes for Vegetation VECs

VEC	Residual Environmental Effects	Direction	Extent	Duration	Magnitude
Uncommon Site Series	Loss of vegetation Changes in structure and composition	Negative	Local	Long-term	Low-Moderate
Wetlands	Loss of vegetation Potential change in abiotic site conditions Changes in structure and composition	Negative	Local	Long-term	Low
Old growth forests	Loss of vegetation Changes in structure and composition	Negative	Local	Long-term	Low
Rare Plant Communities	None	None	None	None	None
Rare Plants Sitka columbine and spike redtop	Loss of vegetation	Negative	Local	Short to medium term	Low
Rare Plants Sheathed cotton-grass and northern bog bedstraw	Loss of vegetation Potential change in abiotic site conditions Changes in structure and composition	Negative	Local	Medium-term	Low
Rare Plants Hairy butterwort	Loss of vegetation Changes in structure and composition	Negative	Local	Long-term	Low

The Project-related environmental effects will have additive nibbling environmental effects on vegetation resources in the area. At baseline 94.5% of the vegetation in the LSA is undisturbed. After completion of construction, an additional 0.7% (159.7 ha) of the LSA will have been modified by human disturbance, leaving 93.8% remaining vegetation cover undisturbed.

There are other land uses in the LSA that affect vegetation resources in a similar manner. Incremental additions to existing environmental effects create cumulative environmental effects that are considered to be negative, localized, long-term, events of low magnitude for each VEC with one exception (Table 8-6). There will be a small incremental contribution by the Project to an existing cumulative environmental effects to uncommon site series BWBSwk1-02. Again, it should be recognized that the LSA is an a narrow 2 km-wide corridor, centred on an existing disturbed corridor and adopted for vegetation characterization purposes only with no particular ecological relevance. Although the BWBSwk1-02 site series has experienced cumulative environmental effects of moderate magnitude within this corridor, it is represented on the long forested crests and ridges in the area. On the basis of this analysis the residual environmental effects from the development of the Project do not, in combination with other environmental effects in the area, have the ability to measurably change the health or sustainability of the vegetation VECs. Residual Project-related environmental and the contribution of the Project to cumulative environmental effects are considered to be not significant for all the vegetation VECs.

Table 8-6
Summary of Project-incremental and Cumulative Environmental Effects to Vegetation VECs

Environmental Issue	Project Design Features	Non-Mitigated Environmental Effects	Mitigation and Protection Planning	Project Residual Environmental Effects Significance	Cumulative Residual Environmental Effects Significance	Monitoring
Alteration of uncommon site series	Minimize new disturbance through use of existing corridors	Potential alteration of forested structural stages from uncommon site series BWBSwk1-02 and BWBSmw1-02	Narrow RoW where possible. Activity suspension and modification to avoid rutting Minimal grading and organic salvage where possible Use of clean, weed tested, native seed mixes with low seeding rates. Weed control measures No legumes in the reclamation seed mix on these sites.	Alteration of 1.4 ha of site series BWBSwk1-02. Project contributes to existing disturbance within 2 km corridor. Alteration of 0.7 ha (0%) of site series BWBSmw1-02. Project environmental effects not significant.	There is a small incremental contribution to existing cumulative environmental effects for site series BWBSwk1-02 within the LSA. Variant well represented outside LSA, therefore cumulative environmental effects are considered not significant. Cumulative environmental effects not significant for site series BWBSmw1-02.	None
Alteration of wetland vegetation	Minimize new disturbance through use of existing corridors	Alteration of 17.6 ha (3.2%) of wetland site series	Narrow RoW where possible Construction under frozen ground conditions where possible Trench-width ditching Use and removal of corduroy Organic salvage No wetland dewatering No reclamation seeding	Project environmental effects not significant.	Cumulative environmental effects not significant.	None

Environmental Issue	Project Design Features	Non-Mitigated Environmental Effects	Mitigation and Protection Planning	Project Residual Environmental Effects Significance	Cumulative Residual Environmental Effects Significance	Monitoring
Loss of old growth	Minimize new disturbance through use of existing corridors	Loss of old growth forest vegetation through clearing	Reroute or narrow RoW where possible	Loss of 13.6 ha (0.9%) of old growth forest in LSA Project environmental effects not significant.	Cumulative effects not significant.	None
Loss of rare plant communities		No environmental effect				
Loss of rare plant individuals	Minimize new disturbance through use of existing corridors	Environmental effects to: sheathed cotton-northern bog bedstraw hairy butterwort Potential environmental effects to Sitka columbine spike redtop	Avoid rare plants by narrowing RoW Aerial crossing of Narraway River Seed collection	Project environmental effects not significant.	N/A	Monitor recovery 3 years minimum

8.2 Additional Submissions

8.2.1 Westcoast

Westcoast stated that a rare plant spring and summer survey would be undertaken for Compass Hill and all re-routed areas with a moderate or higher probability of supporting rare plant species. Westcoast committed to submit, in August 2002, a rare plant report based on these surveys. The report would include the occurrence and locations of rare plants along with mitigative measures and follow-up monitoring plans.

Westcoast identified various measures to reduce the disturbance to vegetation:

- Scheduling construction during winter would minimize the need for stripping across the whole width of the right of way over areas of fairly level terrain;
- Narrowing the right of way and not using extra work space at locations with rare plants or uncommon site-series;
- Reducing the working width of the right of way, wherever feasible, at locations where the Project parallels existing corridors; and
- Reducing the 10 m width of temporary work space along the proposed right of way, wherever possible.

Westcoast indicated that it is in discussion with the provincial agencies regarding the elimination of a grass cover except in erosion-prone areas and allowing the natural seed bank and vegetative propagules in the soil to reclaim to a native vegetation cover.

8.2.2 Intervenors

In relation to the proposed conditions[3], Ms. Biem recommended that the spring and summer rare vegetation surveys on re-routed areas of the Project be filed prior to the completion of the CSR.

The proposed condition stated:

> "Westcoast shall file with the Board, at least 21 days prior to the commencement of construction or as otherwise directed by the Board, a copy of its spring and summer rare vegetation surveys on re-routed areas of the Project."

8.2.3 Department of Fisheries and Oceans Canada

DFO, in its 16 September 2002 letter[4] noted that Environment Canada continues to encourage Westcoast to seek compensation opportunities to secure similar Old Growth Forest habitats found elsewhere in the region.

8.3 Conclusions

With respect to Ms. Biem's recommendation that a condition be placed on Westcoast to have the rare plant surveys for re-routed areas of the Project be filed prior to the completion of the CSR, it is noted that, as the CSR is a planning tool, it need only provide sufficient information to make a determination regarding significance with respect to environmental effects. Identification of specific instances of rare plants at this stage of the process is not always necessary to reach a conclusion regarding the environmental effects. Provided that the applicant has identified possible occurrences of such plants prior to construction and effective measures to mitigate any potential environmental effects on the rare plants, it is reasonable for the decision makers to reach a conclusion without knowing the specific results of the surveys for the re-routed portions of the right of way.

Based on the information filed from previous rare plant surveys along the right of way and Westcoast's above-mentioned commitments to file mitigative measures and follow-up monitoring plans for any subsequent discovery of rare plants, further information is not required at this time to deem the CSR complete. Further, based on Westcoast's commitment to submit rare plant surveys in August, the proposed condition is not considered necessary.

Revegetation issues, including the success of allowing natural seed bank and vegetative propagules in the soil to reclaim a native vegetation cover, would be documented in the six month post-construction environmental report which is outlined in more detail in Chapter 15, Cumulative Effects. Westcoast has committed to prepare post-construction environment reports for the two subsequent years following construction, at which time the revegetation issues would be further monitored.

Based on Westcoast's commitments and with the implementation of its proposed mitigation and monitoring, the Project is not likely to cause significant adverse environmental effects on vegetation.

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[3] It is customary during Board hearings to provide, for comment on by parties, proposed conditions for any certificate that might be issued.

[4] Comments provided pursuant to paragraph 16 of Amended Hearing Order and Directions on Procedure AO-02-GH-2-2002

Chapter 9

Wildlife

9.1 Westcoast Submission - Revised Draft CSR - 4 January 2002

9.1.1 Existing conditions

The proposed Project traverses an area that provides a broad range of habitat conditions for wildlife. As a result, a high diversity of wildlife species are potential seasonal or year-round residents in the region of the Project (see Appendix J in the EIA [AXYS 2001a]). From the potential array of species expected to occur in the region, four key species or valued environmental components (VECs) were selected for assessment purposes. These VECs were selected based on their vulnerability to potential project environmental effects and the sensitivities of their populations and/or habitats in the region. The VEC selection process and rationale for species selection are further detailed in Section 5.1.1.8.4. The following discussion provides background information on the four species that were selected as VECs.

9.1.1.1 Grizzly Bear

Grizzly bears range throughout the region encompassing the proposed Grizzly Extension Pipeline route (AFLW 1991; BCMELP 2001a). In general, grizzly bears use a wide variety of habitat types, with general preference for semi-open, mesic habitats with minimal human intrusions (Craighead and Mitchell 1982; IGBC 1987; AFLW 1990). In their use of different seasonal habitats, grizzly bears range widely (IGBC 1987). In the central Rocky Mountains of Alberta, male home ranges varied between 200 km^2 and 2100 km^2 while females ranged between 100 km^2 and 400 km^2) (Carr 1989). In the Parsnip River area located approximately 100 km west of the RSA, Ross *et al.* (2000) found that female home ranges averaged 105 km^2, with those in mountain habitats having smaller average ranges (60 km^2) than those in plateau habitats (300 km^2).

In general the foothill and plateau habitats in the region encompassing the proposed pipeline are considered to be inherently good quality habitat for grizzly bears (AFLW 1991; MELP 1995). Nonetheless, grizzly bear populations in the region are generally considered to be vulnerable due to negative environmental effects on habitat and populations from past and ongoing human activities (AXYS 2001a). Accounting for innate habitat quality and the adverse effects of human activity, Fuhr and Demarchi (1990) estimated current grizzly bear habitat potential to range from moderate to high in the Hart Foothills and from low to moderate in the Kiskatinaw Plateau, the biogeoclimatic units intersected by the pipeline route. Throughout British Columbia, management of grizzly bear populations and habitats is administered according to Grizzly Bear Population Units (GBPUs), and is also guided through Land and Resource Management Plans (Dawson Creek LRMP 1999). Under the objectives defined in these plans, the Resource Management Zone (RMZ) encountered by the proposed project are to "manage medium and/or high capability grizzly bear habitat to assist in sustaining viable, healthy grizzly bear populations." At the same time, the General Management Directives for the area call for the provision of "opportunities and access for oil and gas exploration, development and transportation." Management of access and maintenance of wildlife movement corridor integrity are two related themes identified in the LRMP that direct grizzly bear population and habitat management.

Fuhr and Demarchi (1990) estimated grizzly bear populations in British Columbia by extrapolating estimates taken from population research projects and applied to similar biogeoclimatic variants within ecosections. Potential environmental effects of human land use activity in specific regions were then also considered in estimating population densities within one of five classes[5]. Using these methods, there were an estimated 82 grizzly bears in Limited Entry Hunting (LEH) zone 7-19, which encompasses the RSA in British Columbia (Figure 9-1). More recently, it has been estimated that there are now 92 grizzly bears in LEH zone 7-19 (26.8 bears/1,000 km^2) (T. Hamilton, pers. comm.). These estimates compare to a recent DNA based population estimate from the Prophet River area, located 400 km north of the RSA, a region that is partially comprised of the biogeoclimatic zone (BWBS) that is predominant in the RSA (Poole *et al.* 2001). While certain grizzly populations in British Columbia have been predisposed to limited entry hunting, LEH zone 7-19 and adjacent zones 7-21 and 7-22 have been temporarily closed "because existing population estimates show significantly higher than acceptable mortality rates of both females and total grizzly bears for this population. Zone 7-20 was previously closed and remains closed"(BCMWLAP 2001b).

In Alberta, the pipeline route occurs in similar multiple use lands where wildlife management, resource extraction and recreational activities all occur. As discussed earlier, the Alberta equivalent to British Columbia's LRMPs have traditionally been the Sub- Regional Integrated Resource Plans (IRPs). However, there is no IRP for the region in Alberta that is intersected by the pipeline. Recently, Alberta Environment has been leading a new initiative, referred to as Integrated Resource Management (IRM), which will have important implications for the planning and management of regional cumulative environmental effects. To date, the strategy has focussed on the Eastern Slopes, which have been divided into northern and southern sections. The boundary for the northern portion falls under an initiative called Northern East Slopes (NES) Sustainable Resource and Environmental Management Strategy (Alberta Environment 2000b). No formal plan is yet available from this planning initiative. The pipeline route intersects the western portions of Alberta provincial Wildlife Management Units (WMUs) 445 and 356. These WMUs are contained within larger Grizzly Bear Management Areas 2B and 4A, in which human-caused grizzly bear mortality was estimated to have exceeded sustainable levels based on extrapolated populations densities (9 to 12 grizzly bears/1000 km^2) (AFLW 1991). Intensive habitat and bear-human conflict management and conservation programs were recommended in order to sustain grizzly populations in the northwestern region of the province (AFLW 1991).

9.1.1.2 Caribou

The woodland caribou is considered a sensitive species both federally and provincially (Appendix J in AXYS 2001a). Caribou in the proposed Project area are represented by both the northern and mountain ecotype. In Alberta, caribou are confined to several large and distinct areas of the northern boreal forest and Rocky Mountains, and the herd is estimated to be as few as 3500 (Alberta Environmental Protection [AEP] 1996). Specifically, there are approximately 150 caribou in the Narraway area that summer in the mountains. During winter these caribou move into the boreal plains of Alberta and generally outside of the RSA (Hervieux 2000). In British Columbia, caribou abundance is considered to be low (*i.e.*, 1 caribou per 25-250 km^2) to moderate (*i.e.*, 1 caribou per 3.4-25 km^2) in the proposed project area (MELP 1988). Caribou occur throughout the year in the region encompassing the proposed RoW, with greatest

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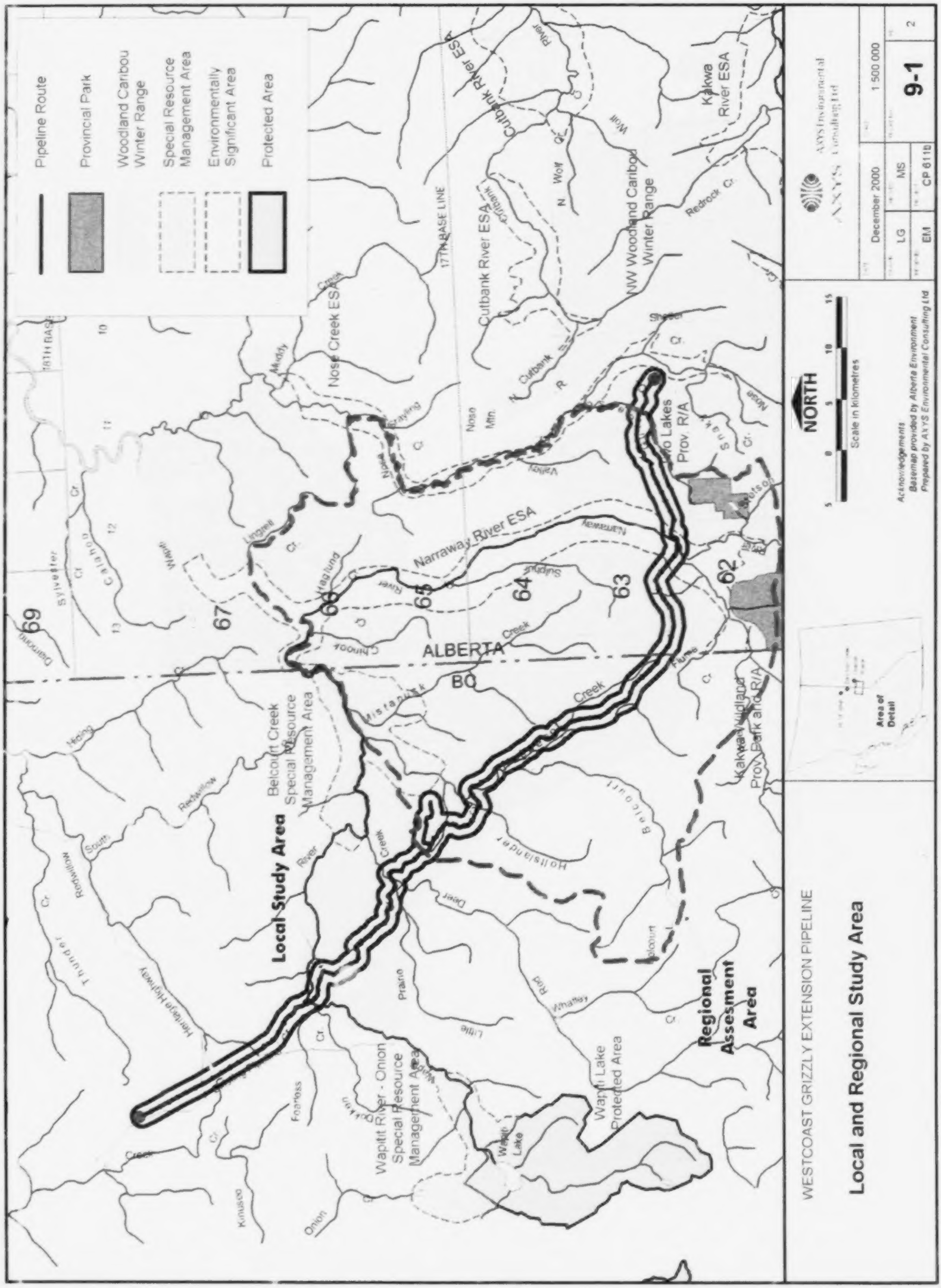
[5] Class 1 = 76-100 bears/1000 km^2, Class 2 = 51-75, Class 3 = 26-50, Class 4 = 6-25, Class 5 = 0-5.



WESTCOAST GRIZZLY EXTENSION PIPELINE

Local and Regional Study Area

Pipeline Route
Provincial Park
Woodland Caribou Winter Range
Special Resource Management Area
Environmentally Significant Area
Protected Area
Local Study Area
Regional Assesment Area
ALBERTA
BC
Belcourt Creek Special Resource Management Area
Wapiti River - Onion Special Resource Management Area
Wapiti Lake Protected Area
Kakwa Wildland Prov. Park and R/A
Two Lakes Prov. R/A
Narraway River ESA
Nose Creek ESA
Cutbank River ESA
NW Woodland Caribou Winter Range
Kakwa River ESA
17TH BASE LINE
18TH BASE
Nose Mtn.
Heritage Highway
Wapiti Lake
62
63
64
65
66
67
69
NORTH
Scale in Kilometres
0
5
10
15
Acknowledgements
Basemap provided by Alberta Environment
Prepared by AXYS Environmental Consulting Ltd
AXYS Environmental Consulting Ltd
December 2000
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2
Area of Detail

numbers in the LSA anticipated to coincide with seasonal migrations between winter and summer ranges that are generally concentrated outside the LSA.

The Project traverses identified caribou habitat, as well as general ungulate winter range (AEP 1998b; Hervieux and Backmeyer, pers. comm., 2001). The open coniferous forests and bogs in the Project area provide low elevation winter habitat for an interprovincial caribou population (Dawson Creek LRMP 1999). Good quality summer range in the RSA is considered fairly abundant while winter range is generally considered more limiting. Overall, habitat capability and suitability is considered to be moderate in the area (MELP 1997).

Simpson *et al.* (1997) used four criteria (population viability, habitat threats, level of habitat protection, habitat capability/suitability) to rank the Hart Ranges as being moderately important for the conservation of caribou relative to other areas in British Columbia (ranking fifth out of 13 regions in British Columbia). Management of caribou requires maintenance of some old growth forest stands, as well as access management (Dawson Creek LRMP 1999). Strategies for managing caribou include "minimizing fragmentation of critical low elevation caribou habitat by minimizing the development of new access routes and/or managing the use of existing access" (Dawson Creek LRMP 1999). Under access strategies, the plan calls for the coordinated development and use of linear industrial corridors, the development of "Sensitive Access Management" guidelines with multi-stakeholder groups to restrict or close public access in some areas, and the management of new road access to ensure "that pre-existing levels of public motorized access are maintained."

The season for recreational hunting for woodland caribou in Alberta was terminated in 1981. In British Columbia, the pipeline route intersects LEH zone 7-19 where a limited entry draw was in effect for bulls (August 20-31) and five point bulls (September 1-30) (MELP 2000; www.elp.gov.bc/ca/wild). In both Alberta and British Columbia, unregulated hunting for woodland caribou by First Nations also occurs.

9.1.1.3 Marten

Marten range throughout British Columbia and Alberta, but are generally absent from the prairie areas (Strickland *et al.* 1982). Marten occupy late-successional forest habitats throughout most of their range, existing in the greatest densities in coastal old-growth forests. They are generally considered common in most late-successional habitats, except in the dry interior of British Columbia (*i.e.*, Ponderosa Pine biogeoclimatic zone), where their occurrence is considered sporadic (Stevens and Lofts 1988; Stevens 1995). Marten prefer stands with various age and size classes since these stands provide a greater diversity and abundance of foraging areas and protective cover than do even-aged stands (Buskirk and Powell 1994). Marten are opportunistic predators and will feed on a variety of small animals that are characteristic of boreal forest environments, including red squirrel, red-backed vole, snowshoe hare, and numerous other small birds and mammals.

While specific information on population sizes and distribution is limited in the Project area, marten are a regionally important trapped species and are assumed to be reasonably abundant and well distributed in suitable habitat in the assessment area. Winter track surveys conducted as part of this assessment (AXYS 2001b) found that marten were widely distributed throughout the Project area, being recorded in 19 of 26 ecosystem units surveyed. Marten were most abundant in the old structural stage of the ESSFmv2–06 (Bl-Alder-Horsetail) site series (8.5 tracks/km-day). Similarly, marten were relatively common in the old and medium stages of the BWBSwk1-07 (Sb-Horsetail-Spagnum) site series (2.2 and

2.0 tracks/km-day, respectively), and the old structural stage of the BWBSwk1-01 (Sw-Huckleberry-Step Moss) site series (2.0 tracks/km-day).

In the Redwillow Creek Resource Management Subzone, which is encoutered by the Project, the Dawson Creek LRMP (1999) in B.C. calls for the management of "critical habitat for furbearers (lynx, marten, fisher) to assist in sustaining viable, healthy furbearer populations."

9.1.1.4 Black-throated Green Warbler

The breeding range of the black-throated green warbler in Alberta is mainly in the north half of the province although there are records from the foothills as well (Salt and Salt 1976; Norton 1999). The black-throated green warbler's breeding range in British Columbia includes the Peace River Lowlands, likely west to Chetwynd, north to the Blueberry River and south of the Peace River in the Kiskatinaw Plateau (Campbell *et al.* 2001). Scattered records suggest that small numbers may breed on the eastern slopes of the Rockies in the Taiga Plains and Northern Boreal Mountains (Campbell 1997). The black-throated green warbler has been observed during other breeding bird surveys conducted in the region by AXYS (Strom *et al.* 1995) and others (Booth and Merkens 1999). As a neotropical migrant, this species only occurs in the proposed development area during the spring and summer months, and is absent during the winter.

Black-throated green warbler breeding habitat includes mature riparian white spruce or mixed wood forests, (Salt and Salt 1976; Enns and Siddle 1996). Francis and Lumbis (1979) found nesting territories in riparian balsam poplar/aspen with scattered tall white spruce, while Godfrey (1986) suggests that conifers with a mixture of birch or aspen are ideal. In the Tumbler Ridge area, the black-throated green warbler was observed in riparian spruce and mature white spruce stands (Strom *et al.* 1995). In mixedwood forests, this species can tolerate a high deciduous component as long as a few tall conifer trees are present (Cooper *et al.* 1997).

Songbird surveys conducted as part of this assessment in June 2001 (AXYS 2001c) detected only one male black-throated green warbler. The bird was recorded in an old growth stand of white spruce, balsam poplar, and alder (BWBSmw1-7) within the riparian zone of Red Deer Creek. This resulted in a density of 0.2 territories/40 ha for the species in the LSA.

Under the General Management Direction objectives of the Dawson Creek LRMP (1999) in B.C., the area is to be managed to "sustain and manage wildlife habitat for red, blue and yellow-listed species."

9.1.2 Assessment Approach

9.1.2.1 Issue Identification

As discussed in Section 9.1.3.1, pipeline developments in forested settings potentially affect wildlife through three basic processes:

- Reduced Habitat Availability;
- Blockage of movements; and
- Direct or indirect mortalities.

In areas where the Project will parallel existing RoWs, the environmental effects on wildlife resulting from the Project are expected to be minimal (*e.g.*, habitat alteration and fragmentation), and will likely have little potential for affecting wildlife resources on a regional basis. However, since environmental effects on wildlife may occur in areas of new RoW development, this aspect was the focus of this assessment. Provincial wildlife managers have identified the area between Huguenot Road in BC and Two Lakes Road in Alberta as being of interest in this respect. Disturbances in this area to date have been mainly due to seismic cut lines. Project environmental effects in this area could include further reductions in habitat availability and increased mortalities associated with human or predator access along the RoW. Potential environmental effects of the pipeline development will be minimized through a combination of route selection, timing of construction, and the implementation of site specific mitigation measures (*e.g.*, access control).

As discussed earlier, the Project occurs within a region that has been zoned for and affected by multiple land use activities (Dawson Creek LRMP 1999). Specific Project environmental effects may interact in a cumulative manner with existing and future land use pressures. As a result, this assessment, addressed the localized environmental effects of the Project and involved an analysis of cumulative environmental effects on the VECs.

9.1.2.2 Boundaries

9.1.2.2.1 Spatial Boundaries

Two primary study areas were used to complete the various components of the assessment (Figure 9-1):

- Local Study Area (LSA); and
- Regional Study Area (RSA)

The LSA is a 2 km wide corridor centred on the pipeline route which encompasses all of the proposed Project components. The majority of site-specific wildlife observations, ground surveys, and ground-truthing for pre-typed terrestrial ecosystem mapping (TEM) units occurred within the LSA. The LSA was used to discuss localized, project-specific environmental effects. Specifically, habitat based analyses for the four selected wildlife species was conducted within this 2 km wide corridor.

The RSA reflects the large, multi-seasonal ranges of both caribou and grizzly bear. It is recognized that caribou and grizzly bear using the Project area have seasonal ranges that extend well beyond the LSA and that these animals are exposed to cumulative land use pressures over and above that found in the LSA. In addition, the area at the British Columbia and Alberta border between the Huguenot Road and the Narraway valley has been identified in consultation with provincial resource management specialists as important wildlife habitat for caribou and grizzly bear. This is where the greatest potential for new access along the RoW would be created. Consequently, the RSA boundaries were established to include major drainages associated with Narraway River through to the British Columbia/Alberta border (Figure 9-1). The RSA boundaries were also based on Licensed Trapper Areas, and generally followed the height of land. For analytical purposes, the RSA was divided into sub-regional study areas (SRSA), reflecting both ecological and administrative boundaries (AXYS 2001a).

9.1.2.2.2 Temporal Boundaries

Construction of the proposed Project is scheduled for the period from mid-July 2002 to spring break-up (2003). To assess project-specific environmental effects, three assessment periods were used (*i.e.*, baseline, peak construction (2003), and operations (up to 2005). For the cumulative environmental effects assessment, an additional assessment period was included (pre-disturbance). For peak construction and operations development scenarios, future projects and activities (as defined in section 4.1.2, step 3) were considered in the analyses. These are detailed in the Project and Cummulative Effects sections for the respective VECs.

9.1.2.3 Analytical Techniques Used to Characterize Environmental Effects

Quantitative and qualitative tools were used to measure project-specific (incremental) and cumulative environmental effects for the four wildlife VECs. Three quantitative tools were used to analyze and evaluate Project and cumulative environmental effects:

Habitat Availability: an analysis of change in the quality and quantity of habitat in the LSA. Analyses were completed for all four wildlife species.

Core Security Habitat: an analysis of the changes in core security habitat, and the associated effects on mortality risk to wildlife within the RSA. Analyses were completed for grizzly bear and caribou.

Road Density Class: an analysis of changes in road and trail densities, and related to changes in mortality risk to wildlife within the RSA. Analyses were completed for grizzly bear and caribou.

Detailed descriptions for these quantitative assessment techniques are provided in the EIA (AXYS 2001a). Details on the habitat rating and TEM techniques used as a basis with which to assess habitat availability are provided in greater detail in Geowest (2000) and RIC (1998), respectively. An overview of techniques used to determine habitat availability, core security habitat and road densities are provided below.

9.1.2.3.1 Habitat Effectiveness and Availability

Habitat availability for wildlife reflects both the inherent suitability of the land base for providing life requisites for wildlife (i.e., food, water, cover) and the effects of human disturbance on the land base. Habitat availability can be directly influenced by the physical alteration of natural terrain and vegetation resulting from either natural or human-related occurrences. It can also be indirectly influenced by zones of sensory disturbance adjacent to physically altered areas created by human activities, where habitats become less attractive to wildlife because of increased disturbance or mortality risk.

Generally expressed in habitat units (HUs), habitat availability is commonly used as a measurable parameter for assessing the effects of land use developments on wildlife. The technique involves several basic steps:

- Mapping and calculation of habitat suitability based on identifiable biophysical units (*e.g.*, TEM units) within the study area;
- Calculation of total habitat availability within the study area under pre-disturbance and baseline conditions, based on the habitat rating and area of each biophysical unit;

- Integration of land use activities (including proposed projects) and corresponding zones of influence onto the habitat suitability map for various assessment periods;
- Calculation of changes in habitat suitability rating within land use footprints and zones of influence; and
- Calculation of net changes in overall habitat availability within the study area for the various assessment periods.

For purposes of this assessment, ecosystem units derived from terrestrial ecosystem mapping for the LSA were used as the basis for habitat mapping and rating. Wildlife habitat suitability ratings, previously developed for use in the same region (Geowest 2000), were adopted for caribou, grizzly bear, marten, and black-throated green warbler. Multiplication of unique habitat ratings for each TEM polygon by the polygon area (ha) provided an estimate of habitat availability (HUs). Summation of these HUs provided a quantitative measure of habitat availability for the four key species in the LSA. Habitat availability was estimated under pre-disturbance, baseline, peak construction, and operational conditions. Change in habitat availability was then calculated as the percent change in HUs.

For each of the four species selected for assessment, zones of influence were then applied around disturbance features for each development scenario (Table 9-1). Habitats within these zones were decreased in rated value by two levels for low use sources of disturbance, and decreased by four levels for high use sources (see Access Use Assumptions below for description of high and low use). These adjusted habitats were rated no less than low (*i.e.*, 3 for a 4 class rating, 5 for a 6 class rating; see Wildlife Habitat Ratings below).

For grizzly bear, an adapted version of the USFS (1990) Cumulative Environmental Effects Model (CEM) was applied (Gibeau *et al.* 1996) to determine buffer widths. For caribou, changes in habitat effectiveness were quantified using disturbance parameters and coefficients developed in northern Alberta (James 1999, Dyer 1999). For marten and the black-throated green warbler, the buffer distance was estimated based on aspects of each species' ecology, and how these species may react to human disturbance.

The term habitat effectiveness has also been used in the assessment below. Habitat effectiveness represents the percentage of potential habitat availability (i.e., percentage of theoretical pre-disturbance habitat availability) remaining on the land base after the effects of direct disturbance and zones of influence have been factored in. For example, 80% habitat effectiveness represents a 20% loss of habitat availability from pre-disturbance conditions.

Table 9-1
Zones of Influence around Surface Disturbances for Different Development Periods

Development Period	Buffer Width (m)			
	Caribou	Grizzly Bear	Marten	Black-throated green warbler
Baseline	250	500	250	100
Peak Construction	250	500	250	100
Operations	250	500	250	100

9.1.2.3.2 Wildlife Habitat Ratings

Habitat suitability for the four select wildlife species was rated using the TEM habitat rating system (Geowest 2000, RIC (1998). This system uses either a four (high, moderate, low, nil) or six (very high, high, moderately high, moderate, low, nil) class rating system, depending on the amount of scientific knowledge of the species, and availability of provincial benchmarks on which to assess relative ratings (Geowest 2000, RIC 1998). The ecology of caribou, grizzly bear, and marten are relatively well understood and documented, and a six class rating system was used. Less is known about the ecology of the black-throated green warbler, therefore a four class system was used (Table 9-2).

Habitat suitability for the four select species was rated for different seasons (Table 9-2). These seasons reflect critical periods for each species, and include aspects of foraging (*e.g.*, spring or late summer berry feeding), breeding, security, and thermal (*e.g.*, hibernation) habitat requirements (Geowest 2000).

Table 9-2
Seasonal and Habitat Rating Classes for Select Species

Species	Season	# Seasons Rated	# Habitat Suitability Rating Classes
Caribou	spring, summer/fall, early winter, late winter	4	6
Grizzly bear	spring, fall, winter	3	6
Marten	spring, summer/fall, winter	3	6
Black-throated green warbler	spring, summer/fall	2	4

9.1.2.3.3 Core Security Habitat

Core security habitat analysis provides an understanding of changing habitat security for wildlife species of concern. The approach accounts for environmental effects of human disturbances to habitats, habitat fragmentation, and associated loss of habitats deemed ineffective as secure, core (minimal size) habitats. Core security habitat was determined for caribou and grizzly bear under pre-disturbance conditions and three development scenarios: baseline, peak construction, and operations.

A modified approach to estimate the extent and distribution of core security habitat was conducted for grizzly bear based on the approach recommended by the Interagency Grizzly Bear Committee (IGBC 1994) and used in previous assessments of human developments on grizzly bears (Gibeau *et al.* 1996; Parks Canada 1997). Core secure habitat for grizzly bears includes those useable areas within the species' range minus human-impacted habitats. Reduced security occurs within 500 m of linear or point sources of human disturbance, and with habitat blocks too small or fragmented to accommodate a minimum female grizzly feeding radius over a 24 hour period. Unusable areas are considered to be areas above certain elevation thresholds (ca. 2,400 m asl.), or areas consisting of rock, ice and bare soil. For the purposes of this analysis, minimum estimated feeding radii for female grizzly bears (10.1 km^2) was adopted for use from the northern part of the Northern Continental Divide Ecosystem.

A similar approach was used to assess core security habitat for caribou, yet with certain differences. First, reduced security habitat was determined within 250 m of linear or point sources of human disturbance (Dyer 1999). Second, caribou do not maintain individual territories, but migrate between seasonal ranges. Therefore, minimum patch sizes (*e.g.*, 10.1 km^2 for grizzly bear) was not considered to be a necessary criteria for caribou.

9.1.2.3.4 Access Use Assumptions

Access (*e.g.*, sections, lines, roads) and point source (*e.g.*, well sites) features were classed as high or low activity use based on mapping information with measurable data, site specific observations, and professional opinion. Once access features were classified, appropriate buffering was applied for both grizzly bear (500 m buffer) and caribou (250 m buffer). Overgrown cutlines were not included in analyses and seasonal periods were not considered. The classification of specific features into high and low use categories is included in Axys 2001a. Because of a limitation in specific and accurate information of activity levels along seismic lines, the environmental effects of access were analyzed using three scenarios of varying degrees of buffering to provide a range of conditions:

- only high use features buffered;
- all features buffered, less 50% of seismic lines (seismic lines were then treated as having equal ecological environmental effects as low use roads); and
- all features buffered.

9.1.2.3.5 Road Density

Road densities throughout the RSA were calculated using a similar analysis to that of core security habitat. Road densities were calculated using GIS and a "moving window" program that allowed an assessment of the distribution of road density classes within the RSA. The approach to delineating road density classes was similar to those developed and used by the IGBC (1994) (USFWS 1993) and the Northern Continental Divide Ecosystem Access Task Group (NCDEATG 1995). The specific assumptions and analyses for determining road classes and density mirrored those of the core security habitat analyses.

9.1.2.3.6 Route Modifications

Following completion of the habitat availability modeling, the pipeline route was altered in some areas. The greatest change occurred at the Gunderson Creek crossing where, at the request of Alberta Lands and Forests, the route was shifted north to follow an existing pipeline RoW (Section 2.1.4.2.4). Most other pipeline re-routes were small deviations for engineering purposes, and occurred within the 2 km wide LSA. To permit assessment of this new routing outside the 2 km wide LSA, field inspections were conducted for both vegetation classification and wildlife potential, and ecosystem units were mapped and analyzed (see Vegetation). Because the mapped habitat polygons generally run perpendicular to the pipeline route, the same type and quality of wildlife habitat was intersected by both the old and new routing. Given these conditions, it was reasonable to assume that the altered route alignment did not result in a substantive change in wildlife habitats intersected by the pipeline based on the original analyses. Because the re-routes occurred either very near to the original alignment or, the case of the Gunderson Creek re-route, along an existing RoW, the re-routes collectively will not measurably affect original estimates of core security habitat and road densities. Therefore, the re-routes are considered to not affect the overall assessment of the four wildlife species based on the original analyses and pipeline routing.

9.1.2.4 Residual Environmental Effects Rating Criteria

Project-specific and cumulative environmental effects on wildlife were assessed by identifying potential adverse environmental effects of the Project, developing mitigative strategies for reducing or eliminating such environmental effects, and evaluating the nature and anticipated severity of residual environmental effects after mitigation.

Project-specific environmental effects were characterized using three environmental effects attributes (Table 9-3). These attributes were used to describe the nature of residual project-specific environmental effects (*i.e.*, those environmental effects anticipated to persist after mitigation) on wildlife within designated study areas.

For the purposes of the wildlife assessment, a "significant" project effect was considered to be a negative, long-term effect of high magnitude, where high magnitude represents a change in the measurable parameter of interest by >10%. Since the measurable parameters used for wildlife assessment in the CSR are habitat related, (*e.g.*, habitat availability for assessing habitat chance, core security habitat availability for assessing mortality risk), the selection of >10% change as the criteria for high magnitude is conservative and well within the range of natural variability for tolerable habitat change, as natural processes such as fire can radically alter more than 10% of an area's habitat values in a single season. However, as previously discussed in Section 4, the definition and application of these attributes are subjective, and a determination of significance using such criteria is similarly subjective. These attributes have been presented as guides for evaluating significance by the Agency, and have been used here in a conservative fashion to characterize project effects, and to identify measurable effects of sufficient magnitude and duration to warrant their consideration as a measurable contribution to regional cumulative effects.

Table 9-3
Environmental Effects Attributes to Describe Project-Specific Environmental Effects on Wildlife

Attribute	Options	Definition
Scope	Local	Environmental effects restricted to a footprint of project or periphery within the LSA (e.g., pipeline corridor)
	Regional	Environmental effects on a regional basis (e.g., within the RSA)
Direction	Positive	Beneficial environmental effects on wildlife species
	Neutral	No change to wildlife species
	Negative	Adverse environmental effects on wildlife species
Duration[1]	Short-term	Environmental effects are measurable for < 1 year, or < 1 generation of the wildlife species
	Medium-term	Environmental effects are measurable for 1-10 years, or for 1 generation of the wildlife species
	Long-term	Environmental effects are measurable for >10 years, or > 1 generation of the wildlife species
Magnitude[1]	Low	Environmental effects will result in < 1% change in the VEC measurable parameter with the designated study area
	Moderate	Environmental effects will result in 1-10% change in the VEC measurable parameter within the designated study area
	High	Environmental effects will result in >10% change in the VEC measurable parameter within the study area

[1] In the absence of identified project-specific thresholds, quantitative measures of both duration and magnitude were used only as guides in determining the severity of project-specific environmental effects.

Cumulative environmental effects were evaluated by assessing project-specific environmental effects in combination with existing and future project or activities in the designated study area. Existing levels of cumulative environmental effects were calculated at baseline by assessing changes from theoretical "undisturbed" conditions. Undisturbed conditions for the VECs in question were estimated by removing visible human-related disturbances from the landscape, and evaluating habitat values under those conditions by extrapolating from adjacent habitat. The contribution of the proposed Project to cumulative effects was then assessed within the context of levels of cumulative environmental effects. from projects or activities that have been or will be carried out.

Because a project proponent cannot be held responsible for the environmental effects of other unrelated past, present or future land use activities on a resource in question, the review focuses on the degree to which project contributions will change cumulative pressures on the resource. The ability to quantitatively determine the significance of project-specific contributions to cumulative environmental effects on wildlife and wildlife habitat depends upon the availability of established ecological thresholds and policy objectives for a given species. In areas intersected by the proposed pipeline in both Alberta and British Columbia, explicit thresholds or adopted standards for the VECs do not exist. Where applicable, thresholds from similar ecosystems and/or jurisdictions were used to comment on the probable consequences of cumulative environmental effects on resource availability and maintenance, incorporating results of quantitative modeling exercises with information on conservation biology and sustainability principles.

For the purposes of this Project, the significance of project contributions to cumulative environmental effects was evaluated as follows.

Significant Contribution to Cumulative Environmental Effects:

Project contributions to cumulative effects are i) expected to measurably alter the ability of the land base to sustain the resource in question or ii) considered inconsistent with the strategic goals and management options in British Columbia (species management plans and the Dawson Creek LRMP) and Alberta.

Not Significant Contribution to Cumulative Environmental Effects:

Project contributions to cumulative effects are i), not expected to measurably alter the ability of the land base to sustain the resource in question, or ii) considered consistent with the strategic goals and management options in British Columbia (species management plans and the Dawson Creek LRMP) and Alberta.

9.1.3 Environmental Effects Analysis

9.1.3.1 Potential Interactions

Potential environmental effects on wildlife from the proposed Project and cumulative regional environmental effects may occur from individual or combined environmental effects of:

- reduced habitat availability;
- blockage of movements; and
- project-related wildlife mortalities.

The general nature of these environmental effects is described below with specific environmental effects subsequently discussed for species or species groups. Results of the habitat availability analyses for the four select species (*i.e.*, caribou, grizzly bear, marten, and black-throated green warbler) are discussed along with results of core security and road density analyses for grizzly bear and caribou.

Where analytical models are used, results are considered conservative in that model runs do not include potential environmental effects of proposed mitigation (i.e., access control measures). That is, sections of the proposed RoW that will represent new access potential have been assigned a low-use motorized rating during the operational phase of the project, in spite of the fact that proposed access control measures planned for this section of RoW may effectively reduce motorized travel (i.e., ATVs, snowmobiles) to negligible levels. Mitigation is discussed in Section 9.1.4, with results (residual project environmental effects) presented in summary form in Section 9.1.5.

To determine effective measures to deter access along the RoW, planners, biologists and provincial wildlife agency staff conducted an aerial survey of the proposed route and identified key locations for implementing site-specific access control. These include standard measures such as berms, doglegs and slash rollback along new RoW. Other techniques were identified at key locations: directional drills at major creek crossings, boring under blocks of standing trees and revegetation of sections of RoW for habitat restoration. Further details of these mitigation techniques, including their specific locations, rationale for implementation and monitoring plans, are included in the Access Management Plan (AMP) (EPP, Appendix 3) and the Alignment Sheets (Appendix C of the Westcoast Revised CSR, 4 January 2002). In addition to development and implementation of project-specific mitigation Westcoast will participate in regional access management and/or recovery program initiatives (*e.g.*, West-central Caribou Standing Committee; Regional Coordinated Access Management Plan) developed to help address regional wildlife management objectives and stakeholder concerns. Westcoast will actively consult and share information with other stakeholders in the area to coordinate planning and promote enhanced access management throughout the region.

9.1.3.1.1 Reduced Habitat Availability

As previously discussed, habitat availability can be directly influenced by the physical alteration of natural terrain and vegetation resulting from either natural or human-related occurrences. For pipelines, highly localized habitat loss occurs at permanent above-ground facilities (e.g., valve assemblies), while habitat alteration occurs along the RoW or in temporary workspace where native vegetation is removed and replaced through reclamation efforts. Of specific concern would be the potential loss through construction activities of an important localized habitat feature for a special status species.

Habitat availability can also be indirectly influenced by zones of sensory disturbance adjacent to physically altered areas created by human activities, where habitats become less attractive to wildlife because of increased disturbance or mortality risk. Species that reside in the construction area will be exposed to and potentially disturbed by construction activities. Wildlife responses can be expected to vary from elevated heart rates to more overt reactions such as flight and abandonment of local habitat. The severity of response depends on the species of wildlife, the nature of the stimulus, and a variety of environmental factors such as type of habitat and topography where the stimulus is encountered; it may also depend upon the previous experience of individual animals. Generally, pipeline construction can lead to temporary reductions in habitat availability next to centers of construction activity, but can also lead to long-term reductions if the RoW is accessible for recreational use after construction. More permanent facilities, such as well sites and compressor stations, typically reduce habitat availability for longer periods in these localized areas.

Habitat availability can also be influenced through habitat fragmentation. Habitat fragmentation is the process of insularization of habitat into fragments that are either too small to be of functional value or that are not accessible from other habitats (Primack 1993). Pipeline RoWs may lead to forest fragmentation where the RoWs are of sufficient width to discourage crossing by wildlife, or where the RoWs intersect important interior forest habitats, creating edge habitats or unnatural movement or disturbance corridors within large forest blocks.

9.1.3.1.2 Blockage of Movements

Seasonal or daily movements may be blocked or disrupted due to construction activities and, more specifically, the presence of vehicles and construction personnel in and around the Project area. However, given the paralleling and sharing of workspace with existing RoWs for this project, the short duration of activities in localized areas, and mitigation measures to ensure passage of wildlife (EPP, Section 11), the potential for wildlife movements to be significantly disrupted as a result of this Project is remote. Therefore, the assessment does not consider potential blockage of movements as a potential environmental effect for this proposed pipeline development.

9.1.3.1.3 Direct and Indirect (Access-induced) Wildlife Mortalities

Pipeline developments can result in direct wildlife mortalities through active nest or densite disruption, collisions with project vehicles, and unrestricted use of firearms by project personnel. The new access afforded by pipeline RoWs can also increase the risk of hunting related mortalities for some species of wildlife. Additionally, increased human activity associated with new access and facilities leads to increased risk of problematic bear-human conflicts, and the potential for management removals of bears. Quantification of core security habitat and road densities can be used to infer changes in risk to key species such as caribou and grizzly bear due to increased road access density and loss of secure habitat. Where key information was available, direct and indirect risk of mortality is also discussed for grizzly bear in relation to regional population and mortality data.

9.1.3.2 Project and Cumulative Environmental Effects on Grizzly Bear

9.1.3.2.1 Reduced Habitat Availability

The grizzly bear is a landscape species occupying a variety of habitat types within large territories, thus diminishing (but not precluding) the likelihood of significant effects on important localized habitats from oil and gas development (*i.e.*, well site, access road and pipeline development). Grizzly bears may use the grass-dominated communities which will develop along most of the RoWs as a forage source, as these animals often rely on graminoids and early developing herbs as a year-round dietary item (Norstrom 1974; Cole 1975; IGBC 1987). Therefore, the RoWs, once reclaimed and access removed, will provide a foraging area for these species in close proximity to escape cover. In general project effects will be too localized to result in significant reductions in habitat availability from physical habitat alteration.

New RoWs can lead to the fragmentation of grizzly bear habitat. While reclaimed RoWs *per se* do not represent an impediment to bear movements, they may contribute to long term recreational activities in otherwise inaccessible habitat, resulting in the loss of core security habitat. This issue is dealt with in more detail under the discussion on mortality risk below (Section 9.1.3.2.2).

The ongoing activities associated with pipeline construction can result in greater effects on habitat availability in the vicinity of the RoWs during construction, or occasionally during the pipeline's operational phase. Potential disturbances during pipeline operation may occur due to pipeline maintenance activity, or indirectly, through public access and activity along the RoWs.

For grizzly bears, disturbance effects within the proposed Project area may be similar to those observed in relation to other industrial activities including road construction, seismic testing, drilling and helicopter traffic. For example, researchers in southeastern British Columbia and Montana have observed displacement of grizzly bears from distances of 100 to >900 m from open roads (McLellan and Shackleton 1988, 1989; Kasworm and Manley 1990). In general, the significance of reductions in habitat effectiveness and availability will depend on the relative value of intersected habitats to the species of concern and duration of disturbances that can occur.

With respect to cumulative environmental effects, thresholds for grizzly bear habitat availability have not been established for management purposes in either the British Columbia or Alberta portions of the Project area. In light of this, habitat availability thresholds from other Rocky Mountain jurisdictions were considered in the assessment. Parks Canada utilizes a model that predicts that grizzly bears will no longer utilize an area as part of permanent home range if habitat effectiveness (i.e., habitat availability after disturbance) is reduced to less than 80% from pre-disturbance conditions (Parks Canada 2000). In jurisdictions with multiple use objectives, grizzly bear habitat effectiveness thresholds of 60% and 70% have been identified (*i.e.*, 40% and 30% loss of habitat availability) (Parks Canada 1997; USDA 2001).

Potential changes in habitat availability were calculated for grizzly bear during spring, late summer/fall, and winter seasons (AXYS 2001a). At baseline, the LSA provides mostly lower quality habitat for all three seasons, as previous and ongoing human land use activities, primarily forest harvesting and other resource development activities, have contributed to reductions in grizzly bear habitat availability in the LSA. While an assessment of significance is best conducted at the regional scale, it is useful to discuss the results of the local scale analysis to indicate trends and project contributions to those trends.

Project-Specific Effects

The construction phase of the proposed Project will reduce baseline pre-project habitat availability values within the LSA by 13.3% for spring range, 4.0% for late summer/fall range, and 5.7% for winter denning. Because of the short term nature of construction effects, these effects are considered not significant (see Section 9.1.2.4). The operational phase of the Project will reduce baseline habitat availability values within the LSA by 9% for spring range, 2.9% for late summer/fall range, and 5.7% for winter denning. Although long-term, these effects represent a change in habitat availability within the LSA of less than 10%, relative to baseline conditions, and are considered not significant. In addition, with the implementation of proposed mitigation (*e.g.*, access control measures, RoW reclamation), it is anticipated that the localized project environmental effects on habitat availability for grizzly bear will be reduced even further. Nevertheless, in both cases, the residual project effects are measurable. Therefore, they are discussed in a cumulative context below.

Project Contributions to Cumulative Effects

Based on the results of habitat modeling, it is estimated that existing disturbances on the landscape have already reduced grizzly bear habitat availability in the LSA by 68.0% for spring range, by 57.9% for late summer/fall range, and by 5.4% for winter denning from theoretical, "pre-disturbance" conditions (AXYS 2001a). This represents existing habitat effectiveness values of 32%, 42% and 95% for spring range, late summer/fall range and denning habitat, respectively. These measures of habitat change are from within the narrow 2-km wide corridor of the LSA, which is smaller than required for an assessment of environmental effects on grizzly bear habitat and populations, and will to some degree overestimate regional trends within the RSA as the pipeline route was purposefully routed along existing disturbances and through more developed areas where practical. Nonetheless, it is estimated that cumulative environmental effects on spring and fall grizzly bear habitat availability within this 2-km corridor may be beyond thresholds for supporting regular, seasonal grizzly bear use, for a multiple resource use jurisdiction.

Long-term contributions from project operations will incrementally add to the already high levels of cumulative habitat reduction within the LSA, although in a minor fashion. With the addition of the pipeline RoW, grizzy bear habitat availability will be cumulatively reduced by 70.9% for spring range, 59.1% for late summer/fall range and 10.8% for winter denning habitat, relative to theoretical, pre-disturbance conditions. Given the minor contribution of the project to cumulative reductions in habitat availability within the narrow 2 km-wide LSA, it can be concluded that Project contributions to cumulative pressures on habitat availability on a larger regional planning basis will be negligible. In addition, the proposed access control measures for the Project are designed to minimize new access potential and habitat effects from RoW development and are consistent with LRMP objectives for planning and managing access through sensitive areas. Therefore, project effects on habitat availability are considered minor, and project contribution to cumulative effects will not significantly affect habitat availability for grizzly bear in the region.

Additional future projects that may occur in the LSA include timber harvesting activities and Weyerhaeuser's potential, long term access corridor from the Boundary Lake area south to the Goat Creek area, which would ultimately intersect the pipeline RoW near Goat Creek. Currently capped wellsites may also be brought into production in future, although routing for lateral pipelines servicing these wellsites is currently undetermined. It is not expected that Project contributions to future regional cumulative pressures, including those effects of other possible future land use activities, will significantly affect habitat availability for grizzy bear in the region.

The degree to which future development will continue to cumulatively affect grizzly bear habitat availability in the RSA will be largely dependent on the degree to which grizzy bear management initiatives (e.g., access controls) are integrated into the multiple resource plans for the area. From a project perspective it is not expected that the pipeline development will significantly affect regional trends in habitat availability, given the localized nature of its footprint after contstruction and the proximity of the pipeline to existing disturbance corridors with currently reduced habitat values.

9.1.3.2.2 Mortality

The risk of project-related mortality to grizzly bear arises from potential for collisions with project vehicles, unrestricted use of firearms by project personnel and increased access leading to potential for increased firearms-related legal and illegal kills along or near the RoW during project construction and operations. Additionally, increased human activity associated with new access and facilities can lead to increased risk of problematic bear-human interactions and/or conflicts, and related potential for management removals of bears. Further, construction during bear denning seasons can present the risk of project mortality to grizzly bears due to den site destruction or abandonment. Mitigation measures such as RoW development during pre-denning periods , strict adherence to food waste controls at camps and on the RoW and adoption of personnel codes of conduct (firearms restrictions) will help mitigate mortality risks that are directly related to the proposed project. Mitigation measures applicable to grizzly bear are noted in Section 9.1.4.1, and in the EPP and Access Management Plan.

New RoW development will lead to new access potential and an associated increased risk of mortality from legal and illegal kills. There is no empirical model currently available that allows accurate quantification of grizzly bear mortality risk in relation to distance of new access (*i.e.*, number of bear deaths/km RoW). Consequently, and because of the association between human-caused grizzly bear mortality and access development, access-induced mortality risk was assessed indirectly using access-focused analytical models: core security habitat and road density.

With respect to cumulative environmental effects, core security habitat and road density thresholds for grizzly bear management purposes have not been established in either British Columbia or Alberta portions of the RSA. In light of this, and in order to help assess environmental effects of land use activities on grizzly bear populations (*i.e.*, notwithstanding the region's competing resource extraction and species conservation objectives), it was recommended that ecological thresholds from other Rocky Mountain jurisdictions be considered as an assessment guide (J. Jorgenson, pers. comm., 2001). These include regional level core security habitat targets of between 80% and 100% of bear management units in Banff and Jasper National Parks (Parks Canada 1997; 2000), although in high visitor use areas, the percent of core security habitat area for some management units falls below this target. Federal recovery efforts for grizzly bear in key areas of northwestern United States discuss the need to restrict high density roading (*i.e.*, > $2mi/mi^2$) to between zero and 20% of the land base in primary conservation areas (USFWS 1993; IGBC 1994). On multiple use lands, where both wildlife conservation and human land use activities are desired, the development of security and road density goals is a complex and evolving process. In multi-use areas of southern British Columbia and in northern Washington, Idaho and Montana, land use planning processes are considering core security habitat minimums of 55% of the land base and high density road classes to be restricted to 26% or less of the land bases at the regional level (USDA 2001; BCMELP 2001). Final management decisions from these examples from other areas are unknown at this time.

Project-Specific Effects

During construction and operations, the Project will contribute incrementally to a loss in grizzly bear core security habitat and an increase in road density levels. Relative to baseline (pre-project) conditions, these Project environmental effects will represent low magnitude reductions (*i.e.*, less than 1% change) in all SRSAs for core security habitat, and moderate magnitude increases (*i.e.*, 1-10% increase) in areas supporting moderate to high road density classes (AXYS 2001a). With the implementation of proposed access management (see Access Management Plan – EPP, Appendix 3), it is anticipated that project effects will be reduced even further. Because project effects represent less than a 10% change in baseline values for the measurable parameters selected for assessment purposes within the RSA, they are considered not significant.

Project-Contribution to Cumulative Effects

With respect to baseline (pre-project) conditions, cumulative land use activities in the RSA already exceed the National Park's thresholds and proposed multiple land use thresholds from the other areas referred to above for core security habitat and road density (AFLW 1991; BCMWLAP 2001b). At baseline, it is estimated that only 37.3% of the RSA currently supports core security habitat, based on 50% buffering of linear features[6]. Similarly, high-density road classes already occur over 35% of the RSA (AXYS 2001a). These existing cumulative environmental effects on core security habitat and road densities in the RSA have likely contributed to recently reported unsustainable levels of human-caused grizzly bear mortalities in LEH 7-19 in British Columbia and in the western portions of BMAs 2b and 4a in Alberta (BCMWLAP 2001b).

With the inclusion of the proposed pipeline, estimates for core security habitat areas for the construction and operational assessment phases of the Project indicate only minor additional reductions in these areas (i.e., reduction, before considering any project mitigation from 37.3% of the RSA to 37.0%). The minor contributions of the Project to reductions in core security habitat reflect the degree to which core security habitat has already been compromised by existing land use disturbances. Plans for progressive access control measures for the Project (and subsequent effectiveness monitoring) to minimize new access potential meet the intent of access management strategies in the Dawson Creek LRMP. With mitigation, project-contributions to cumulative reductions in core security habitat and cumulative increases in road densities are considered too minor to significantly affect the mortality risk levels for grizzly bears in the region. This conclusion is considered particularly relevant, in light of the hunting closures for bears over much of the project area.

Little information was available on foreseeable future land use activities in the RSA that would further contribute to cumulative environmental effects on core security habitat, road densities and associated human-caused mortality risk. Other activities that may occur in the RSA include timber harvesting and associated access development by Weyerhaeuser, CFI and SBEP in and around portions of the RSA. Timber harvesting is mandated in the region's land use policy (*i.e.*, Dawson Creek LRMP), and, to the extent it occurs, timber harvesting and associated road development will likely overlap with the proposed Project both spatially (RSA) and temporally (operations). In addition to timber harvesting, gas development is also progressing in and around the RSA with the potential for future well pad, access and pipeline tie-ins. Such development will continue to cumulatively affect grizzly bear habitat availability in the RSA to an extent that will be largely dependant on the degree to which grizzly bear management initiatives (*e.g.*, core security habitat management; access controls) are integrated into the multiple resource plans for the area.

As discussed above, the Project's contributions to cumulative reductions in core security habitat availability and increases in road access density are not expected to significantly affect the mortality risk levels for grizzly bear in the region, given the limited amount of new RoW proposed for the Project, its proximity to existing linear corridors in many areas, and the access control mitigation proposed for the Project.

9.1.3.3 Project and Cumulative Environmental Effects on Caribou

As noted in the EIA (AXYS 2001a), caribou are the primary ungulate species of concern as portions of their regional populations depend on winter range near the proposed project (the LSA intersects migratory habitat used by caribou to move between winter and summer ranges). Of most concern is the potential for increased access into the area between the Huguenot Road in British Columbia and the Narraway valley in Alberta. Human land use activity in this area has been primarily limited to seismic activity. A potential increase in access along the pipeline RoW may affect caribou by increasing mortality from both natural predators (*e.g.*, wolves) or hunting by humans (James 1999). In response to this concern, a Caribou Protection Plan (CPP) was prepared for Alberta Land and Forest under the guidelines for the West Central Caribou Standing Committee. This plan focuses on access management in the BC/Alberta border area. The provisions of the CPP related to access management have all been integrated in the Access Management Plan.

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[6] While accurate information is lacking on actual human use levels on many linear features in the RSA, it is felt that the 50 % buffering scenario may best reflect the combination of motorized activity on portions of seismic lines and disuse of and vegetative regrowth on others.

9.1.3.3.1 Reduced Habitat Availability

Similar to the grizzly bear, the caribou is a landscape species occupying a variety of habitat types within large territories, thus diminishing (but not precluding) the likelihood of significant effects on important localized habitats from oil and gas development (*i.e.*, well site, access road and pipeline development). Caribou may use the grass and shrub-dominated communities which will develop along most of the RoWs as a forage source, as these animals often rely on graminoids and early developing herbs as a spring to fall dietary item. Therefore, the RoWs, once reclaimed, will provide a potential foraging area for these species in close proximity to escape cover. In general, direct project effects to habitat will be too localized to result in significant reductions in habitat availability from physical habitat alteration.

New RoWs can lead to the fragmentation of caribou habitat. While reclaimed RoWs *per se* do not represent an impediment to caribou movements, they may contribute to long term recreational activities or increased predator movements in otherwise remote, inaccessible habitat, resulting in the loss of core security habitat. This issue is dealt with in more detail under the discussion on mortality risk below (Section 9.1.3.3.2).

Construction activities may lead to sensory disturbance and reduced habitat availability for caribou and other ungulates. Construction will overlap with the critical winter period for caribou (January through April). Caribou and other ungulates are mobile and will generally demonstrate some displacement (*i.e.*, generally less than 1 km in wooded or hilly terrain) away from the immediate vicinity of activities (Horejsi 1979; Morgantini 1984, Jalkotzy 1996). However, there is no evidence in the literature to suggest that such short-term displacement persists or results in significant decreases in local animal numbers (Bangs and Bailey 1982), provided that increased hunting pressures are not associated with the development. Given the relatively homogeneous habitat conditions occurring within the Project area (*i.e.*, pine and white spruce forest on upland sites, black spruce in lowlands, small areas of deciduous forest throughout), displaced animals will have the ability to temporarily relocate away from the RoWs without being forced into sub-optimal habitats. The species' mobility and use of large ranges are particularly important given the relatively small size and linear configuration of the LSA.

Project -Specific Effects

The construction phase of the proposed Project will reduce baseline (pre-project) habitat availability values within the LSA by 7.9% for spring range, 10.8% for late summer/fall range, 2.6% for early winter range and 5.7% for late winter range. Because of the short term nature of construction effects, these effects are considered not significant (see Section 9.1.2.4). The operational phase of the Project will reduce baseline habitat availability values within the LSA by 7.7% for spring range, 6.3% for late summer/fall range, 2.5% for early winter range and 5.5% for late winter range. Although long-term, these effects represent a change in habitat availability within the LSA of less than 10%, relative to baseline condition, and are considered not significant. Project effects will likely be less than indicated from habitat modeling, as the proposed pipeline RoW (*i.e.*, LSA) would only intersect spring/fall habitats used in a transient fashion by caribou, as well as some limited winter habitat (P. Oberg, pers. comm., Brown and Hobson 1998). As well, with the implementation of proposed mitigation (*e.g.*, access control measures, RoW reclamation), it is anticipated that the localized project effects on habitat availability for caribou will be reduced even further. Nevertheless, in both cases, the residual project effects are measurable. Therefore, they are discussed in a cumulative context below.

Project Contributions to Cumulative Effects

Previous and ongoing human land use activities have contributed to the reduction in caribou habitat availability in the LSA. Relative to theoretical pre-disturbance conditions, caribou habitat availability in the LSA is estimated to have been reduced by 40.8% for spring range, 47.5% for (summer/fall) range 15.2% for early winter range and 43.1% for late winter range at baseline (AXYS 2001a). These decreases in habitat availability have been quantified within the relatively small 2 km wide corridor centered on the proposed pipeline, and may not be reflective of general land use patterns in the region - as the pipeline route was intentionally located to parallel existing disturbance to the degree practical.

Long-term contributions from Project operations will incrementally add to the already high levels of cumulative habitat reduction within the LSA, although in a minor fashion. With the addition of the pipeline RoW, habitat availability will be cumulatively reduced by 45.4% for spring range, 50.8% for late summer/fall range, 17.3% for early winter range and 46.3% for late winter, relative to theoretical, pre-disturbance conditions. Given the minor contribution of the Project to cumulative reductions in habitat availability within the narrow 2 km-wide LSA, it can be concluded that Project contributions to cumulative pressures on habitat availability on a larger regional planning basis will be negligible. In addition, the proposed access control measures for the Project are designed to minimize new access potential and habitat effects from RoW development and are consistent with LRMP objectives for planning and managing access through sensitive areas. Therefore, project effects on habitat availability are considered minor, and Project contributions to cumulative effects will not significantly affect habitat availability for caribou in the region.

Additional future projects that may occur in the LSA include timber harvesting activities and Weyerhaeuser's potential long term access corridor from the Boundary Lake area south to the Goat Creek area, which would ultimately intersect the pipeline RoW near Goat Creek. Currently capped wellsites may also be brought into production in future, although routing for lateral pipelines servicing these wellsites is currently undetermined. It is not expected that Project contributions to future regional cumulative pressures, including those effects of other possible future land use activities, will significantly affect habitat availability for caribou in the region.

The degree to which future development will continue to cumulatively affect caribou habitat availability in the RSA will be largely dependant on the degree to which caribou management initiatives (*e.g.*, access controls) are integrated into the multiple resource plans for the area. From a project perspective, it is not expected that the pipeline development will significantly affect regional trends in habitat availability, given the localized nature of its footprint after construction and the proximity of the pipeline to existing disturbance corridors with currently reduced habitat values.

9.1.3.3.2 Mortality

Direct project-related caribou mortalities may occur during both construction and operations from collisions with project vehicles and from unrestricted use of firearms by project personnel. As was discussed in the mortality section for grizzly bear, construction timing and adoption of personnel codes of conduct (firearm restrictions) will help mitigate these potential mortality risks that are directly related to the proposed project. Mitigation measures applicable to caribou and the other wildlife VECs are noted in Section 9.1.4.2, and are outlined in detail in the EPP and Access Management Plan.

The risk of access-induced caribou mortality associated with new RoW development was assessed using core security and road density analyses. Determination of significance of Project related and cumulative environmental effects is based on a consideration of both ecological thresholds for maintaining populations and land use policy and management goals. With respect to land use policy, management guidelines in British Columbia (LRMP) qualitatively stipulate the need for conservation efforts for caribou in areas that are also considered multiple resource use zones. However, there are not yet any thresholds defined for caribou habitat and population management. Although woodland caribou distributions have been found to decline near linear developments (*i.e.*, an avoidance response) (Dyer 1999; James 1999; Oberg 2001), it has not yet been determined if, or how, this distribution response affects caribou demographics (P. Oberg, pers. comm., 2001). In the absence of quantitative goals for habitat protection and road access development, and undefined terms for overall land use direction, a clear determination of the significance of cumulative regional environmental effects with specific respect to provincial land use policy is not possible. Currently, cumulative environmental effects and development thresholds (based on demographic response) are highlighted as primary research objectives for both the Boreal Caribou Committee (BCC) and the West-central Alberta Caribou Standing Committee (WCACSC).

Project-Specific Effects

During construction and operations, the Project will contribute incrementally to a loss in caribou core security habitat and an increase in road density levels. Relative to baseline (pre-project) conditions, these Project environmental effects will represent low magnitude reductions (*i.e.*, less than 1% change) in all SRSAs for core security habitat, and moderate magnitude increases (*i.e.*, 1-10% increase) in areas supporting moderate to high road density classes (AXYS 2001a). With the implementation of proposed access management (see Access Management Plan – EPP, Appendix 3), it is anticipated that project effects will be reduced even further. Because project effects represent less than a 10% change in the baseline values for measurable parameters selected for assessment purposes within the RSA, they are considered not significant.

Project Contributions to Cumulative Effects

Relative to pre-disturbance conditions, it is estimated that 68.1% of the RSA currently supports core security habitat for caribou at baseline, based on 50% buffering of linear features[7]. Similarly, high-density road classes already occur over 35% of the RSA (AXYS 2001a). As indicated above, habitat security and road density thresholds for caribou management purposes have not been established in either the British Columbia or Alberta portions of the RSA.

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[7] While accurate information is lacking on actual human use levels on many linear features in the RSA, it is felt that the 50 % buffering scenario may best reflect the combination of motorized activity on portions of seismic lines and disuse of and vegetative regrowth on others.

With the inclusion of the proposed pipeline, estimates for core security habitat areas for the construction and operational assessment phases of the Project indicate only minor additional reductions in these areas (i.e., reduction from 68.1% to 67.6%). The minor contributions of this Project to reductions in core security habitat reflect the degree to which core security habitat has already been compromised by existing land use disturbances. Plans for progressive access control measures for the Project (and subsequent effectiveness monitoring) to minimize new access potential meet the intent of access management strategies in the Dawson Creek LRMP. With mitigation, project-contributions to cumulative reductions in core security habitat and cumulative increases in road densities are considered too minor to significantly affect the mortality risk levels for caribou in the region. This conclusion is considered particularly relevant, given the limited legal hunting opportunities over much of the project area.

As discussed above for habitat availability, only qualitative information is available on future land use activities that will contribute to cumulative environmental effects on core security habitat, road densities and associated human and predator related mortality risks. These include access development associated with natural gas exploration and development activity and timber harvest operations (see Section 5.1.2). Additional future activities in the area will further negatively influence the ability of the land base to support caribou to an extent that will be largely dependant on the degree to which caribou management initiatives (*e.g.*, core security habitat management; access controls) are integrated into the multiple resource plans for the area. As discussed above, the Project's contribution to cumulative reductions in core security habitat availability and increases in road access density are not expected to significantly affect the mortality risk levels for caribou in the region, given the limited amount of new RoW proposed for the Project, its proximity to existing linear corridors in many areas, and the access control mitigation proposed for the Project.

9.1.3.4 Project and Cumulative Environmental Effects on Marten

9.1.3.4.1 Reduced Habitat Availability

Project development will generally result in the localized conversion of a forest community to an early successional graminoid/forb and low shrub community in the short to medium term. While this conversion will locally reduce denning and escape cover for marten, it will also result in a foraging area for marten in close proximity to cover, once small mammals (e.g., voles, deer mice) reoccupy the RoW. Therefore, the RoW development will not represent a significant loss of marten habitat, either locally or regionally.

Wide, multi-utility corridors that are subjected to intensive vegetation management can become an impediment to marten movements, and can fragment otherwise useable marten habitat. However, for this project, the developed RoW will be 20 to 30 m in width, and even combined with existing linear corridors, will not be sufficiently wide to impair cross RoW movements. The establishment of a graminoid/forb/low shrub community on the RoW will further encourage use by marten, as will the coarse woody debris left in rollback areas.

The risk of significant construction-related sensory disturbance (and reduced habitat availability) will be minimal for marten, other furbearers, and small mammals in the vicinity of the proposed Project area.

While small territorial animals such as marten and most other furbearers will avoid a RoW during actual construction, these animals will not significantly shift their territorial distributions in response to RoWs (Morgantini 1994; Eccles and Duncan 1987), particularly once vegetative cover has become re-established on the RoW.

The sustainability of marten can become an issue where cumulative land use developments remove a large portion of the mature forests from the land base. Little information exists on the thresholds of environmental effects from reduced habitat availability, habitat fragmentation, or altered habitat diversity on martens, and no quantitative thresholds for maintaining marten populations have been determined (Ruggerio *et al.* 1994). Likewise, thresholds vary depending on management objectives of the resource. For martens, this may simply include management for a sustained fur yield (trapper interests), or management of a more naturally functioning viable population, taking into account local population dynamics (*e.g.*, gene flow, population structure) and natural variability (*e.g.*, environmental and population variation). The study area is located in a region zoned as multiple use (Dawson Creek LRMP 1999). This plan allows recreational use, trapping, off-highway vehicle use, logging, and petroleum and gas exploration and development as acceptable uses. Therefore, thresholds for maintaining marten habitat and populations should be considered in the context of these multiple land use objectives.

Trends in marten populations as a result of habitat loss and trapping suggest that martens are resilient after the negative environmental effects of disturbances have been mitigated or removed completely. For example, martens have undergone numerical and distributional declines in eastern Canada, largely as a result of harvesting of late-successional conifer forests or trapping pressures. Specifically, access by trappers via logging roads increases the potential for declines in marten populations and trapping has accounted for 90% of all documented mortalities in some areas (Hodgman *et al.* 1994). However, marten populations have responded positively following implementation of trapping limits and habitat restoration (Ruggerio *et al.* 1994).

Because specific thresholds are unclear, the best available information has been used to derive threshold estimates for maintaining marten habitat and populations. In general, thresholds for martens may be related to forest cover requirements. One hypothesis predicted that Eurasian marten populations may increase in response to forest fragmentation that left 45% pristine intact forest. This increase in marten abundance was largely related to expected increases in prey availability in small openings (Brainerd 1990). Similarly, in order to maintain a residual population of marten within a commercially clearcut forest, 25% of the forest was suggested to be retained in overmature conditions (Soutiere 1979). Retention of 20 to 25 m^2/ha basal area of trees in pole and larger trees was also speculated to provide adequate habitat for martens (Soutiere 1979). The Ontario Ministry of Natural Resources has established requirements for maintaining marten habitat under forest harvesting regimes. These requirements include:

- retaining of 10 to 20% of the forest at the landscape level in suitable condition for martens;
- ensuring suitable stand conditions for martens, including more than 40% conifer stand composition and 50% conifer canopy closure within these stands;
- ensuring 75% of cores areas (30 to 50 km^2) are comprised of suitable habitat;
- gaps of unsuitable habitat 1 to 2 km wide should be minimized at the landscape level; and
- stands of suitable marten habitat should be large enough to support 25 or more adult martens, based on core areas derived from density estimates of 0.6 to 0.8 martens/km^2 in good to moderate habitat.

Project-Specific Effects

The construction phase of the proposed Project will reduce baseline habitat availability values within the LSA by 9.4% for spring habitat, 10.8% for late summer/fall habitat, and 10.7% for winter habitat. Because of the short term nature of construction effects, these effects are considered not significant (see Section 9.1.2.4). The operational phase of the Project will reduce baseline habitat availability values within the LSA by 7.0% for spring habitat, 7.2% for late summer/fall habitat, and 8.1% for winter habitat. Although long-term, these effects represent a change in habitat availability within the LSA of less than 10%, relative to baseline condition, and are considered not significant. With the implementation of proposed mitigation (*e.g.*, access control measures, RoW reclamation), it is anticipated that the localized project effects on habitat availability for marten will be reduced even further. Nevertheless, in both cases, the residual project effects are measurable. Therefore, they are discussed in a cumulative context below.

Project Contributions to Cumulative Effects

Potential changes in habitat availability from cumulative disturbances were calculated for marten during spring, summer/fall, and winter seasons. Relative to theoretical pre-disturbance conditions, marten habitat availability in the LSA is estimated to have been reduced by 49.1% for spring habitat, 40.4% for summer/fall habitat, and 42.9% for winter habitat at baseline (AXYS 2001a). These decreases in habitat availability have been quantified within the relatively small 2 km wide corridor centered on the proposed pipeline, and may not be reflective of general land use patterns in the region, as the pipeline route was intentionally located to parallel existing disturbance to the degree practical.

Long-term contributions from Project operations will incrementally add to the already high levels of cumulative habitat reduction within the LSA, although in a minor fashion. With the addition of the pipeline RoW, habitat availability will be cumulatively reduced by 52.7% for spring habitat, 44.7% for late summer/fall habitat, and 47.5% for late winter habitat, relative to theoretical, pre-disturbance conditions

While it is possible that marten habitat availability has been compromised, it is difficult to determine the significance of these cumulative environmental effects, as specific thresholds are unavailable. The studies discussed above provide some general indication of potential thresholds for determining the significance of cumulative environmental effects to marten populations within the context of the multiple use management objectives for this region. Based on these studies, it would appear that the amount of remaining habitat available in the LSA is likely at an acceptable level for martens. Under the operations scenario (which includes project-specific environmental effects), 47.3% to 55.3% of the LSA is projected to exist as seasonally available habitat relative to theoretical predisturbance values. Using approximate minimum values of forest cover (*i.e.*, available habitat of 25% to 45%) discussed above for maintaining marten populations, the LSA is still above this threshold.

Given the minor contribution of the Project to cumulative reductions in habitat availability within the narrow 2 km-wide LSA, it can be concluded that project contributions to cumulative pressures on habitat availability on a larger regional planning basis will be negligible. In addition, the proposed access control measures for the Project are designed to minimize new access potential and habitat effects from RoW development and are consistent with LRMP objectives for planning and managing access through sensitive areas. Therefore, project effects on habitat availability are considered minor, and project contributions to cumulative effects will not significantly affect habitat availability for marten in the region.

Additional future projects that may occur in the LSA include timber harvesting activities and Weyerhaeuser's potential long term access corridor from the Boundary Lake area south to the Goat Creek area, which would ultimately intersect the pipeline RoW near Goat Creek. Currently capped wellsites may also be brought into production in future, although routing for lateral pipelines servicing these wellsites is currently undetermined. It is not expected that Project contributions to future regional cumulative pressures, including those effects of other possible future land use activities, will significantly affect habitat availability for marten in the region.

9.1.3.4.2 Mortality

Project-related mortality may occur as a result of collisions with project vehicles or direct destruction of roosts, or maternal dens for martens. Mortalities incurred from destruction of den sites and roosts are expected to be minimal. For example, because marten typically establish dens within interior old-growth forest stands and the proposed pipeline route largely follows existing RoWs, the potential of den destruction will be limited. Therefore, project contributions are not expected to significantly affect mortality rates for marten in the region.

9.1.3.5 Project and Cumulative Environmental Effects on Black-throated Green Warbler

9.1.3.5.1 Reduced Habitat Availability

Pipeline construction will result in some alteration and fragmentation of forest habitat. While some loss of forest nesting habitat for the black-throated green warbler and other songbirds will occur along the proposed project area due to land clearing, this loss will be insignificant given the availability of habitat on a regional basis. The potential for forest clearing to add to the regional fragmentation of forest nesting habitat is small as most clearing will occur along existing forest edges and linear clearings and environmental effects are considered not significant.

Construction for the proposed Project will result in limited sensory disturbance to the black-throated green warbler and other birds, as clearing activities for both construction phases will be timed to avoid the incubating and fledging period for most species (May to mid-July). Most individuals (*i.e.*, adults and fledged young) along the RoWs will be able to relocate away from the sources of disturbance.

Overall disturbance environmental effects to the black-throated green warbler and other birds will be further minimized through the short duration of project construction activity. The potential for significant construction-related sensory disturbances and associated reductions in habitat availability will be minimal for most species. Winter-resident species are highly mobile and, in the event of temporary disturbance from pipeline construction, will be able to select temporary alternate habitat situated away from the source of disturbance. The black-throated green warbler and other neotropical migrants will be absent during the winter season, and will therefore not be affected by winter development activities.

As with marten, the sustainability of breeding birds can become an issue where cumulative land use developments remove a large portion of the mature forests from the land base. Several studies have shown that black-throated green warblers avoid disturbed or edge habitats and small forest patches (Erskine 1977; Darveau *et al.* 1995; Germaine *et al.* 1997), and may be reluctant to cross habitat openings (Rail *et al.* 1977). Linear corridors such as pipeline RoWs may also improve access for Brown-headed Cowbird which are known to regularly parasitize black-throated green warbler nests (Morse 1993). Freedman *et al.* (1981) found that environmental effects of forest fragmentation, through selective logging, are severe if forests are thinned by about 45-75%. In eastern North America, local extirpations have been observed in heavily fragmented forests (Askins and Philbrick 1987; Litwin and Smith 1992). Despite these studies, critical thresholds in landscape fragmentation and habitat loss, beyond which populations may decline more rapidly, have not been established.

Forest harvesting activities are likely to have the greatest environmental effects on the long-term population viability of black-throated green warblers (Norton 1999; Drapeau *et al.* 2000). Forest harvesting not only removes large areas of suitable habitat, but forest management practices (*i.e.*, short rotations and elimination of mixed wood stands) will reduce the availability of forests suitable for breeding over the long-term (Cooper *et al.* 1997).

Project-Specific Effects

The construction phase of the proposed Project will reduce baseline (pre-project) habitat availability values within the LSA by 1.6% for spring habitat, and 1.6% for late summer/fall habitat. Because of the short term nature of construction effects, these effects are considered not significant (see Section 9.1.2.4). The operational phase of the Project will reduce habitat availability within the LSA by 1.6% for spring habitat, and 1.6% for late summer/fall habitat. Although long-term, these effects represent a change in habitat availability within the LSA of less than 10%, relative to baseline conditions, and are considered not significant. With the implementation of proposed mitigation (*e.g.*, access control measures, RoW reclamation), it is anticipated that the localized project effects on habitat availability for the warbler will be reduced even further. Nevertheless, in both cases, the residual project effects are measurable. Therefore, they are discussed in a cumulative context below.

Project Contributions to Cumulative Effects

Potential changes in habitat availability from cumulative disturbances were calculated for the warbler during spring and summer/fall seasons. The LSA provides areas of relatively high quality habitat for both seasons. However, previous land use activities have contributed to the reduction in the quality and quantity of black-throated green warbler habitat. Relative to theoretical pre-disturbance conditions, warbler habitat availability in the LSA at baseline is estimated to have been reduced by 14.4% for spring and summer/fall habitat (AXYS 2001a). These decreases in habitat availability have been quantified within the relatively small 2 km wide corridor centered on the proposed pipeline, and may not be reflective of general land use patterns in the region, as the pipeline route was intentionally located to parallel existing disturbance to the degree practical.

Long-term contributions from Project operations will incrementally add to this cumulative habitat reduction within the LSA, although in a minor fashion. Within the addition of the pipeline RoW, habitat availability will be cumulatively reduced by 15.8% for spring and late summer/fall habitat, relative to theoretical, pre-disturbance conditions. Although specific habitat thresholds are unavailable for the warbler, it would appear that the amount of remaining habitat available in the LSA is likely at an acceptable level for this species. Under the operations scenario (which includes project-specific environmental effects), approximately 85% of the LSA is projected to exist as seasonally available habitat.

Given the minor contribution of the project to cumulative reductions in habitat availability within the narrow 2 km-wide LSA, it can be concluded that project contributions to cumulative pressures on habitat availability on a larger regional planning basis will be negligible. In addition, the proposed access control measures for the Project are designed to minimize new access potential and habitat effects from RoW development and are consistent with LRMP objectives for planning and managing access through sensitive areas. Therefore, project effects on habitat availability are considered minor, and project contributions to cumulative effects will not significantly affect habitat availability for the warbler in the region.

Additional future projects that may occur in the LSA include timber harvesting activities and Weyerhaeuser's potential long term access corridor from the Boundary Lake area south to the Goat Creek area, which would ultimately intersect the pipeline RoW near Goat Creek. Currently capped wellsites may also be brought into production in future, although routing for lateral pipelines servicing these wellsites is currently undetermined. It is not expected that Project contributions to future regional cumulative pressures, including those effects of other possible future land use activities, will significantly affect habitat availability for the warbler in the region.

9.1.3.5.2 Mortality

The greatest mortality risk to birds such as the black-throated green warbler from pipeline developments is the destruction of active nests, with an associated mortality to young-of-the-year. The potential for active nests to be encountered and destroyed by construction for this project will be low as clearing will occur outside of the breeding season. Long-term post-construction related mortality resulting from nest predation and parasitism along new RoWs in forested habitats may locally affect black-throated green warbler distribution and abundance, although such parasitism is generally reported along larger agriculturally-related edges rather than edges developed from narrow RoWs. Therefore, overall project related effects are considered not significant.

9.1.3.6 Decommissioning and Abandonment

For decommissioning and abandonment, the pipeline is generally pigged to remove internal residues, prepared for in ground containment and capped, and surface facilities (e.g., block valves) removed. Decommissioning work activities would occur at only a few locations (*e.g.*, end-points, each side of river crossings), and for any given site would be completed within several days. Any residual access potential provided by the pipeline RoW at that time would be further reduced, as the RoW would be revegetated to forest cover, or allowed to naturally colonize with encroaching native species. Herefore, project effects on wildlife at abandonment would be negligible or positive in direction.

9.1.3.7 Accidents, Malfunctions and Unplanned Events

Accidental events, malfunctions and unplanned events are, by their very nature, unlikely to occur, or will occur at very low frequencies. Remedial actions to correct surface erosion on the RoW or anomalies in the pipe wall (detected from pigging) are perhaps the more common unplanned events associated with pipeline operations. If not of an urgent nature, these actions can often be scheduled during non-sensitive periods of the year (e.g., late summer to early winter) to reduce effects on local wildlife. Any access required to facilitate the movement of equipment would be developed along the RoW or along existing roads and trails. Any increase in access potential created by the remedial work would be removed immediately upon completion of the work. Therefore, effects on wildlife would generally be short-term, localized effects of low magnitude, and would not be considered significant from a project specific or cumulative perspective.

A pipe rupture and associated fire would represent the greatest potential effect on wildlife from an accident or malfunction. Under dry conditions, such an event could lead to major habitat modifications from a wild fire, as well as prolonged construction activity (several weeks) to repair the line. The significance of such an event cannot be reasonably estimated, as its effects will be dependent on the time of year, the location, and the extent of the fire. In addition, the probability of such an event occurring is extremely low, based on pipeline operational history in Canada.

9.1.4 Mitigation

In general, the majority of project-specific environmental effects on wildlife populations and habitats will be negative, localized environmental effects of low to moderate magnitude. Alterations in habitat availability will generally be long term and low to moderate in magnitude within the LSA. For all wildlife VECs, mitigation of project environmental effects to reductions in habitat availability is focussed on modifying route selection such that habitats of lesser importance would be intersected by the proposed route. Temporary access and workspace areas will be reclaimed and the RoW revegetated with native seed mixes. In addition, access control will further reduce environmental effects on habitat availability; although the degree of reduction of project environmental effects will be a function of the long-term effectiveness of this mitigation. Habitat fragmentation due to habitat alteration from RoW clearing is not anticipated to measurably influence habitat use or movements by any of the VECs.

Potential mortalities are a more important issue of concern for all VECs. For the smaller species (*e.g.*, marten and black-throated green warbler), risk of mortality would be associated with direct project environmental effects including nest or den destruction and collisions with project vehicles. Caribou and grizzly bear are also vulnerable to potential direct project mortality. For all wildlife VECs, mitigation of potential direct project-related mortalities is focussed on selection of timing windows for clearing that are outside vulnerable periods for wildlife, and by implementing procedures that control the activities of project personnel and the general public that may lead to wildlife mortalities. These are further discussed below for each VEC. Potential toxicity to wildlife due to hazardous materials spills will be mitigated by spill prevention and contingency response measures detailed in the EPP (Section 16.3).

Clearing and development of the proposed RoW poses the risk of creating new access. Access proliferation is an important issue for both grizzly bear and caribou due to potential to lead to access-induced mortalities from both humans and natural predators (in the case of caribou). Whereas, mitigation of the risks of mortality during construction or associated with operational personnel and activity can both focus on timing and implementation of personnel codes of conduct, mortality risk associated with public access and natural predator activity must focus on curtailing the accessibility and utility of the new RoW. These measures are further discussed below for both grizzly bear and caribou.

9.1.4.1 Grizzly Bear

The main potential environmental effects from the proposed Project on carnivores at the regional population scale may be project-related and access-induced mortalities. These can be incurred directly from destruction or abandonment of inhabited dens, collisions of project vehicles with animals, and unrestricted use of firearms by project personnel. Management removals of bears may occur due to human-bear conflicts. The potential for direct loss of grizzly bears will be reduced through protection measures including project vehicle speed limits, firearms restrictions, control of foods and food wastes, and by conducting a pre-clearing inspection of forested habitats (*i.e.*, for construction that overlaps the November through April denning period).

Rigorous access control measures to be implemented in the Narraway area will act to reduce the magnitudes of access-related project-incremental environmental effects. The risk of access-induced mortality and management removals is of concern as a result of existing access and other human-associated grizzly bear mortalities and removals in the region encompassing the RSA. To this end, the EPP includes recommendations for implementation and monitoring of innovative means to control access at key locations along the proposed RoW where new access could occur and is of concern for VECs (*i.e.*, grizzly bear and caribou). Details are provided in the EPP (Section 11) and in the Access Management Plan (EPP, Appendix 3).

9.1.4.2 Caribou

Increased access into the Narraway River area is of concern owing to the potential environmental effects on caribou from loss of habitat availability due to increased human activity, and from increased mortality risk near low use roads, pipeline and seismic lines. Recent investigations have found that caribou may avoid high use linear corridors (Dyer 1999) which may be related to human activity or increased predation risk from wolves using these landscape features as travel corridors (James 1999). However, because sensory-disturbance and caribou avoidance will be less on low use roads, pipeline corridors, and seismic lines, human and predator-associated mortality risk may be higher near these features compared to higher use facilities. Implementation of the Caribou Protection Plan (CPP), Access Management Plans (EPP, Section 11, Appendix 3), including access control measures and management initiatives between the Huguenot Road and the Narraway River will help reduce access related environmental effects on caribou.

Project related mortality of ungulates from collisions with vehicles, and unrestricted use of firearms by project personnel is also a concern. However, these potential environmental effects are mitigable through enforcement of existing codes of conduct including vehicle speed limits and prohibiting firearms for hunting use (refer to EPP, Section 11).

9.1.4.3 Marten

Pipeline construction will result in localized losses of forest habitat for marten, other furbearers, and small mammals. For species such as marten, which are typically dependent on old-growth stands for denning habitat (*e.g.*, snags and downed woody debris), environmental effects can be more severe if these habitat structures are cleared by construction. Avoiding old-growth stands or directional drilling of riparian areas will limit the potential loss of habitat for marten, other furbearers, and small mammals dependent on these habitat features. These mitigation techniques that will minimize environmental effects to marten are also beneficial to other VECs (*e.g.*, vegetation, fisheries) and have been implemented where practical (Access Management Plan – EPP Appendix 3 and Environmental Alignment Sheets, Appendix C of the Westcoast Revised CSR, 4 January 2002).

9.1.4.4 Black-throated Green Warbler

Concerns for habitat loss were incorporated into pipeline route selection to minimize loss of productive habitat. As discussed, clearing is scheduled to occur outside of the reproductive period for avian species (*i.e.*, May 1 to July 15). Hence, mortalities due to nest destruction and losses of young-of-the-year will be avoided.

9.1.5 Summary of Residual Project-specific and Cumulative Environmental Effects

Project-specific and cumulative environmental effects for wildlife are summarized below (Table 9-4). For project-specific contributions to cumulative environmental effects, summaries provided below are based on the proposed mitigation measures which are directed at addressing key areas of concern, particularly control of access along the new RoW. Monitoring and adaptive management plans will aid in further promoting the long-term effectiveness of access control initiatives. The mitigation and protection planning information described in this section is supplemented by more detailed information provided in the EPP and Access Management Plan (EPP Appendix 3).

9.1.6 Monitoring and Follow-up

Monitoring recommendations of proposed mitigation measures, particularly those aimed at controlling access and thus mitigating risk of access-induced mortality risk to grizzly bear and caribou are discussed in detail in the EPP and Access Management Plan.

9.2 Additional Submissions

9.2.1 Westcoast

Westcoast provided a summary for special status wildlife species, other than those selected as a Valued Environmental Component (VEC), outlining the manner in which these were considered in the assessment. Many of the concerns raised by Environment Canada dealt with migratory species. These concerns were dealt with by Westcoast's change to a winter construction schedule.

Westcoast provided additional discussion on the habitat requirements of ungulate species in the area as they may compare to the requirements of caribou, the ungulate species which was assessed in detail as a VEC. Key ungulate winter range areas identified by Westcoast are the Huguenot Creek Valley, the Narraway Valley, and the Gunderson Creek Valley. Westcoast recognized that the proposed construction schedule may affect ungulate species on winter range, but asserted that this concern is counterbalanced by the preference of wildlife managers that construction occur in frozen ground conditions when the potential impact on habitat due to ground disturbance is reduced. The proposed schedule complies with Alberta Environment's timing requirements for caribou range. Westcoast noted that the duration of disturbance at any one location along the pipeline route would be short, and that similar habitat would be available in the area surrounding the pipeline corridor. Westcoast expects that construction related disturbances would not result in unacceptable stress to ungulates on winter range.

Table 9-4
Summary of Project Specific and Cumulative Environmental Effects on Wildlife

Environmental Issue	Project Design Feature(s)	Mitigation and Protection Planning	Project-Specific Residual Environmental Effects	Cumulative Environmental Effects[8]	Monitoring and Follow Up
Reduced Habitat Availability	Use of existing linear corridors and other disturbances to reduce habitat effects Selection of route to follow gas trend to reduce cumulative effects from gas field infra-structure	• Reduction of extra workspace in key habitats (e.g., caribou late winter range) • Immediate reclamation of temporary workspace and access after construction to approved forest cover • Immediate reclamation of RoW to graminoid /forb mix after construction • Vegetation management on RoW limited to 18m corridor excluding designated boring/drilling and replanting areas • Reforestation along strategic portions of RoW upon pipeline abandonment • Adoption of aggressive access control measures to reduce habitat effects from access/recreational use of RoW	**Grizzly bear:** Long-term, moderate magnitude reductions in habitat availability within LSA from baseline conditions. Negligible regional effects **Project effects not significant**	**Grizzly bear:** Existing high cumulative loss of habitat availability in LSA. **Minor project contributions after mitigation will not significantly affect local or regional habitat availability**	Monitor the effectiveness of reclamation measures at specified intervals Monitor the effectiveness of project access control measures
			Caribou: Long-term, moderate magnitude reductions in habitat availability within LSA from baseline conditions. Negligible regional effects **Project effects not significant**	**Caribou:** Existing high cumulative loss of habitat availability in LSA **Minor project contributions after mitigation will not significantly affect local or regional habitat availability**	
			Marten: Long-term, moderate magnitude reductions in habitat availability within LSA from baseline conditions. Negligible regional effects **Project effects not significant**	**Marten:** Acceptable levels of habitat available in LSA **Minor project contributions after mitigation will not significantly affect local or regional habitat availability**	
			Black-throated green warbler: Long-term, moderate magnitude reductions in habitat availability within LSA from baseline conditions. Negligible regional effects **Project effects not significant**	**Black-throated green warbler** - Acceptable levels of habitat available in LSA **Minor project contributions after mitigation will not significantly affect local or regional habitat availability**	

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[8] Assessment and significance conclusions based on cumulative environmental effects at peak operations. Cumulative environmental effects at this phase include Westcoast's proposed Grizzly Pipeline Extension project, and the Weyerhauser road. Specific and quantifiable information on other future development activity was unavailable. However, mandated future timber harvesting in the RSA will overlap spatially and temporally with the proposed project, and contribute to future cumulative environmental effects in the region.

Environmental Issue	Project Design Feature(s)	Mitigation and Protection Planning	Project-Specific Residual Environmental Effects	Cumulative Environmental Effects*	Monitoring and Follow Up
Indirect Mortality: (from access-induced mortality risk)	Use of existing linear corridors and other disturbances to reduce habitat effects Selection of route to follow gas trend to reduce cumulative access development from gas field infra-structure	• Installation of dog-legs in pipeline RoW at intersections with existing linear corridors to reduce line of sight • Install coarse woody debris rollback on RoW at intersections with existing linear corridors at strategic locations to prevent access along RoW • Employ HDD or boring techniques under sections of standing vegetation and riparian areas to reduce habitat alteration and deter access • Immediate reclamation of temporary workspace and access after construction to approved forest cover • Helicopter-supported maintenance in sensitive areas, except where existing road access is available • Reforestation along strategic portions of RoW upon pipeline abandonment	**Grizzly bear:** Long-term, low to moderate magnitude effects on core security habitat availability and access potential within RSA relative to baseline conditions. Negligible regional effects **Project effects not significant**	**Grizzly bear:** Existing high cumulative loss of core security habitat in RSA and existing high access densities in some areas. **Minor project contributions after mitigation will not significantly affect core security habitat or access availability and the mortality risk level for grizzly bear in the region, given the limited amount of new RoW proposed for the Project, its proximity to existing linear corridors in many areas, and the access control mitigation proposed for the Project,**	Monitoring the effectiveness of reclamation measures at specified intervals Monitoring the effectiveness of project access control measures, particularly between the Narraway Valley and Huguenot Road Participate in cooperative multi-stakeholder programs to assess and manage cumulative regional access. With provincial resource managers, investigate opportunities for an participate in strategic linear corridor closures to improve core security habitat for grizzly bear and caribou in RSA
			Caribou: Long-term, low to moderate magnitude effects on core security habitat availability and access potential within RSA relative to baseline conditons. Negligible regional effects **Project effects not significant.**	**Caribou:** Existing high cumulative loss of core security habitat in RSA and existing high access densities in some areas. **Minor project contributions after mitigation will not significantly affect core security habitat or access availability, given the limited amount of new RoW proposed for the project, its proximity to existing linear corridors in many areas, and the access control mitigation proposed for the Project.**	
			Marten: Long-term, low to moderate magnitude effects on access potential within LSA relative to baseline conditions. Negligible regional effects **Project effects not significant.**	**Marten:** Existing high access densities in some areas. **Minor project contributions after mitigation will not significantly affect access availability, given the limited amount of new RoW proposed for the project, its proxinmity to existing linear corridors in many areas, and the access control mitigation proposed for the Project.**	

Environmental Issue	**Project Design Feature(s)**	**Mitigation and Protection Planning**	**Project-Specific Residual Environmental Effects**	**Cumulative Environmental Effects***	**Monitoring and Follow Up**
			Black-throated green warbler: Long-term, low to moderate magnitude effects on habitat edge availability within LSA relative to baseline conditions. Negligible regional effects. **Project effects not significant.**	**Black-throated green warbler:** Existing high habitat edge availability in some areas from access corridors. **Minor project contibutions after mitigation will not significantly affect access availability, given the limited amount of new RoW proposed for the project, its proxinmity to existing linear corridors in many areas, and the access control mitigation proposed for the Project.**	
Direct Mortality: (From vehicle-animal collisions, removal of problem animals, nest/den destruction)	Project construction scheduled to avoid sensitive spring/early summer reproductive period No construction camps to be established in currently remote areas	• Timing of construction and clearing activities to avoid impacts on nests and minimize disturbance of dens. • Enforcement of personnel firearms/restrictions. • Implementation of strict food waste control measures at camps or on other project sites • Prompt response capability for hazardous materials spills • Suspension of all clearing and construction activities within 100 m of occupied winter canid or bear den, pending consultation with provincial officials. • Design of access roads to limit speeds and avoid blind curves, enforcement of safe speed limits (30-50 km/h). • Reporting of all road kills, and development of specific mitigation measures in identified problem areas.	**Grizzly bear:** Low probability for direct mortality with mitigation **Project effects not significant**	**Grizzly bear:** **Project effects will not contribute significantly to regional cumulative bear mortality rates**	Documentation of all project-related wildlife conflicts for site conflict identification/resolution and future planning. Completion of pre-clearing bear den surveys along proposed RoW, if winter clearing is to occur in high suitability denning habitat. Completion of pre-clearing breeding bird nest surveys along the proposed RoW if unforeseen clearing is to occur during May 1 to July 31 period
			Caribou: Low probability for direct mortality with mitigation **Project effects not significant**	**Caribou:** **Project effects will not contribute significantly to regional cumulative caribou mortality rates**	
			Marten: Low probability for direct mortality with mitigation **Project effects not significant**	**Marten:** **Project effects will not contribute significantly to regional cumulative marten mortality rates**	
			Black-throated green warbler – Low probability for direct mortality with mitigation **Project effects not significant**	**Black-throated green warbler:** **Project effects will not contribute significantly to regional cumulative warbler mortality rates**	

Westcoast submitted that moose, elk and deer are considered less vulnerable to project environmental effects as they tend to benefit from land use activities that convert older forest communities into early successional vegetation communities. The proposed right of way, once reclaimed, would provide an ungulate forage source in close proximity to cover. From a mortality risk perspective, these species have a higher reproductive potential than caribou and their population can be successfully managed by adjusting harvest levels. Westcoast took the view that the analysis of changes in core habitat security and road density that was conducted for caribou can be considered a conservative assessment of mortality risk for moose and other ungulates. The access control measures proposed for the protection of caribou would also be effective in reducing mortality risk for other ungulate species.

In regard to the potential responses of wildlife to construction activity, Westcoast indicated that responses could vary based on species, age and sex. Individual responses may vary from avoidance to seeking the disturbance for protection from predation. Westcoast noted there was no evidence of long-term avoidance of an area by wildlife following construction. With respect to Wapiti's assertion that winter construction through the Huguenot Creek area could have an impact on wildlife populations, Westcoast asserted that the disturbance area is too small to affect much of the range that is available to the animals.

With respect to denning habitat for grizzly bears, Westcoast indicated that the requirements for denning in boreal areas for grizzly bears is not well understood, but the probability of encountering a bear den was quite remote. Westcoast committed to identifying animal habitat prior to construction including pre-surveying for bear activity along the pipeline that might indicate the presence of dens in the area. Westcoast would implement setbacks and minor routing modifications to minimize impact on any wildlife discovered prior to construction.

In determining the appropriate mitigation to address wildlife issues, Westcoast noted that converting a pipeline right of way to a more open shrub and graminoid community may be beneficial as it provides a diversity of forages for both ungulates and bears. Westcoast noted that rights of way tend to, at least temporarily, convert coniferous forest to a grass-dominated community. Westcoast noted that bears are very dependent on grass in the early spring for a large part of their diet and these rights of way can become a foraging area. Westcoast submitted that the key consideration becomes restricting access to the public to avoid bear mortality and that access control and reasonable habitat restoration procedures must be balanced.

Westcoast advised that the equipment and fuel required for the helicopter access to the Compass Hill site would be delivered to a staging area along an accessible road, such as the Huguenot Creek or Red Deer Creek road. The helicopter would use the staging area to move the equipment and resources to and from the site. Westcoast estimated a few days of intensive helicopter activity around Compass Hill would be required. Westcoast's on-site inspector would be responsible for ensuring the helicopter's flight path and elevation would avoid a riparian area along Huguenot Creek and would not disturb wildlife.

To minimize the potential for vehicle and wildlife interactions, Westcoast stated that workers would be bused between the camps and the construction sites each day and would not be permitted to drive private vehicles to the construction sites.

9.2.2 Intervenors

Wapiti indicated that it did not appear that site evaluations had been performed to evaluate the impact on moose, elk and black bear, which were stated as being the "bread and butter" animals of the outfitter. Wapiti indicated that winter construction would have a significant negative impact on the wildlife, especially in the Huguenot area, which is valuable winter habitat especially for moose, elk and black bear. Wapiti testified that the area east of KP 40, south of an unnamed lake, was valuable habitat, especially for moose, due to good forage, good protection, and the presence of water. Westcoast indicated that it was not aware of this area being a particularly important moose area, as the mapping classification system used would not pick up such site specific information. Westcoast indicated that it was prepared to discuss this area with Wapiti if Wapiti thought it was an important issue.

Ms. Mason and family submitted additional literature review on wildlife in the area, including information on grizzly bear, wolverine, fisher, woodland caribou, songbirds, frogs and toads. The review identified habitat fragmentation and mortality associated with human activity as key concerns for several species, including wolverine, caribou and grizzly bears.

Wildlife related concerns raised by Ms.Biem and Ms. Mason are discussed further in the cumulative environmental effects chapter of this report.

9.2.3 Department of Fisheries and Oceans Canada

DFO, in its 16 September 2002 letter[9] forwarded the observation from the Canadian Wildlife Service that, since clearing and construction activities are now proposed during winter months, impacts to breeding birds would be avoided.

9.3 Conclusions

The description of the receiving environment, identification of potential effects on VECs, and the mitigative measures detailed by Westcoast, with the recommendations in Chapter 15, Cumulative Effects, are adequate to address project-specific effects on wildlife. In reaching this conclusion, it is recognized that the primary long-term issues with respect to wildlife are loss of habitat and mortality, both direct and indirect. Both of these issues are predominantly influenced by the creation of new access into previously inaccessible areas. In assessing the impacts of new access, Westcoast's approach to assessing the species which are most sensitive to the creation of new access, namely grizzly bear and caribou is an acceptable approach.

The four wildlife VECs selected by Westcoast, specifically marten, black throated green warbler, grizzly bear and caribou, are considered to be suitable and representative indicator species for the purposes of this assessment. Special status wildlife species have also been appropriately identified and discussed in Westcoast's submission.

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[9] Comments provided pursuant to paragraph 16 of Amended Hearing Order and Directions on Procedure AO-02-GH-2-2002

Westcoast submitted that its modeling was conservative and therefore the potential effects of its Project were likely overestimated. Information brought forward and discussed during the course of the Board hearing served to highlight that access sensitive species are under special management in this region to avoid further decline in population and also that parties with an interest in the Project are concerned with the effects of this Project and future projects on the wildlife and habitat in the area. Given these considerations, further fragmentation in this area is a concern. Accordingly, a conservative approach to modeling is warranted.

The routine mitigative measures Westcoast would undertake for the protection of wildlife are appropriate. However, access management is the primary strategy to mitigate the effects on wildlife. Therefore, to ensure the success of the access management program, further measures are recommended as set out in Chapter 15.

Based on the examination of the Westcoast submissions and the additional information discussed above, the Project is not likely to cause significant adverse environmental effects on wildlife or wildlife habitat, if the mitigative measures outlined, and additional measures recommended in Chapter 15, are implemented.

Chapter 10

Land Use

10.1 Westcoast Submission - Revised Draft CSR - 4 January 2002

10.1.1 Existing Conditions

The proposed pipeline crosses Crown Land in both BC and Alberta. There are no private lands along the entire pipeline corridor. The proposed route does not cross any land designated or proposed as a provincial park, protected area, or recreation area. The closest park to the route is Two Lakes Provincial Recreation Area in Alberta, a 1,566 ha recreation area located south of the Alberta segment of the pipeline. The pipeline crosses the Narraway River ESA (AXYS 2001a) which is important for its habitat values for grizzly bear, elk and key fisheries.

The proposed Project is compatible with the guidelines set out in the Dawson Creek LRMP (1999), specifically the guidelines for the Multi-Values (Foothills) and Alberta Plateau Resource Management Zones. Mitigation measures proposed to control access, and other attempts to co-ordinate industrial activities in the area, are also in accordance with the general objectives for resource activities in the Northern East Slopes (NES) in Alberta, as outlined in the NES Strategy (AENV 2000).

The current use of land and resources for traditional purposes by Aboriginal people is addressed in Section 11.0.

10.1.1.1 Commercial Timber Harvesting

In BC, the proposed pipeline traverses the Dawson Creek Timber Supply Area (TSA 41). The Dawson Creek TSA encompasses approximately 2,278,000 ha, or 63%, of the Dawson Creek Forest District. Since December 30, 1996, the annual allowable cut (AAC) for the TSA is 1,733,033 m^3; this AAC will remain in effect until a new AAC is determined, at the end of 2001 (AXYS 2001a).

Logging activity has occurred within the vicinity of the proposed route, as evidenced by cutblocks. Chetwynd Forest Industries (CFI) (a division of West Fraser Mills Ltd.) has a volume-based forest license in the TSA. CFI operates in the Flatbed Creek, Redwillow River, Wapiti and Red Deer Creek drainages in the vicinity of the proposed route. The Ministry of Forests Small Business Enterprise Program (SBEP) provides small business harvesting operators access to Crown forests in the area (AXYS 2001a). SBEF activity is concentrated between Red Deer and Belcourt Creeks. Past activity has clustered around existing access roads east of Red Deer Creek and in the lower Hotslander Creek drainage, south of the proposed route. A large portion of previously harvested land has been restocked and trees are now over 3m high. Timber resources currently being extracted from this area are being processed in nearby communities such as Chetwynd and Dawson Creek that have large timber processing infrastructure. There are no known woodlots in the area (AXYS 2001a).

On the Alberta side, the proposed pipeline alignment traverses Forest Management Unit G3 (P), which is managed by the East Peace Forest District Office. Weyerhaeuser conducts timber-harvesting activities in this Forest Management Unit in accordance with applicable provincial legislation (AXYS 2001a).

Westcoast has committed to completing a timber cruise prior to construction, to confirm estimates of species, volume and current harvesting, as well as to confirm access points to the RoW and roads to be used to haul timber, and locations of timber decking sites. This work will be conducted when the final alignment is flagged in the field. Upon completion of the timber cruise, appraisal data and a Timber Salvage Plan will be submitted to the Alberta and BC governments along with applications for Licenses to Cut.

Commercial timber harvesting activities are also described in Section 5.1.2.1.

10.1.1.2 Energy Resource Exploration and Development

The discovery of several gas fields in the northeastern region of BC has resulted in exploration and development activities, including seismic, pipelines and associated facilities, roads and well sites. Oil and gas activity is evident within the proposed pipeline RoW. Seismic lines overlay most of the land base in the vicinity of the proposed RoW and are used as access routes by hunters and trappers in the region. Major pipelines include Westcoast's Grizzly Valley RGT system, the Wapiti, the Redwillow, POCO, a Canadian Natural Resources Ltd. pipeline in BC, and a Canadian Forest Oil pipeline, a Anderson/Devon pipeline, and a Canadian Hunter pipeline in Alberta. The level of activities for gas development in the area has increased since the announcement of the Project. There are many existing and abandoned gas well sites found within 20 km of the proposed RoW in BC and Alberta.

Coal bed methane (CBM) resources exist in the northeastern region of BC and the northwestern region of Alberta within the Peace River Coal Field. Several blocks of gas rights that have experimental status with the British Columbia Oil and Gas Commission parallel the pipeline route to the west. To date seven CBM locations have been licensed and four of these drilled. These wells are being tested and technical assessments are underway.

Energy resource exploration and development activities are also described in Section 5.1.2.1.

10.1.1.3 Mining, Exploration and Development

There are several important coal deposits in the vicinity of the proposed route. Exploration was most active in the 1970's and early 1980's, but since that time many coal leases have lapsed. However, in the last two years several small companies have acquired some of the key former leases and have re-evaluated their potential. A recent improvement in coking and thermal coal markets has lead to an increase in coal exploration in the province. There are two tenured coal prospects located within 5 km to the west of the proposed pipeline route:

- Monkman (MINFILE 0931013): The property is comprised of 30 coal leases owned by Fording Ltd. and Sumisho coal which extend into the upper Dokken and Fearless Creek basins. No recent work has been conducted on these leases; and
- Belcourt (MINFILE 0931014): In the late 1970's the Belcourt coal property covered a 25 km long by a 2.5 km band of prospective coal geology that extended from the Red Deer River

southeastward to the head waters of Huguenot Creek. Exploration outlined reserves of close to 114 million tonnes of metallurgical coal. There are currently two blocks of leases, owned by Western Coal Corporation, within that band, a block of three leases on the east side of Red Deer Creek extending into the headwaters of Holtslander Creek, and a block of 4 leases in upper Triad Creek. Test drilling has been carried out on the Holtslander block in the past few years (Bob Lane, MEM, pers. comm.).

On the British Columbia side of the proposed route, there are two existing coal mines near Tumbler Ridge, only one of which is operational. The Quintette Coal Mine was closed in August 2000 but is not decommissioned; and the Bullmoose Coal Mine will be closed in 2003.

10.1.1.4 Hunting and Guide Outfitting

Hunting and guide outfitting opportunities exist in both the BC and Alberta portions of the proposed Project due to the diversity of landscape and wildlife (Dawson Creek LRMP 1999). Hunting occurs on Crown land in the vicinity of the proposed RoW. On the BC side, three Wildlife Management Units (WMU) overlap with the proposed RoW: WMU 7-19 overlaps the BC side of the RoW, except for the northern portion, WMU 7-20 and WMU 7-21 overlap the northern portion of the RoW (AXYS 2001a). On the Alberta side, the proposed RoW passes through three WMUs: 445, 356, and 355 (AXYS 2001a). The most frequently hunted species are moose and elk on the BC side, and moose, elk, and deer on the Alberta side (AXYS 2001a). Other species that are hunted with less frequency include black bear, grizzly bear, sheep, goats, and wolf. Ground birds and waterbirds are also hunted (AXYS 2001a).

The following hunting seasons apply to the area surrounding the proposed RoW, in BC and Alberta:

- spring and fall seasons: black bear and grizzly bear;
- fall season: mule deer, moose, elk, caribou, sharp-tailed grouse, ducks, geese, and common snipe;
- fall and winter season: wolf, coyote, wolverine, lynx, snowshoe hare, and ptarmigan.

While a blanket moratorium on grizzly bear hunting had been in place prior to July 2001 for the Province of British Columbia, the moratorium has since been lifted. In the British Columbia region of the Project there is a limited entry draw for the spring and fall grizzly bear hunting seasons (pers. comm. J. Elliot).

Existing roads in the area of the RoW are used extensively by hunters for single and multi-day trips. Much of the proposed Project area is accessible by standard vehicles. Hunters mainly use All-Terrain Vehicles (ATVs) and snowmobiles for off-road use.

In BC, all non-resident hunters must be accompanied by a licensed guide while hunting big game. The proposed RoW is almost entirely in the registered outfitting area of Wapiti River Outfitters (WMU 7-19); however, the portion of the RoW near the proposed western tie-in is allocated to Mr. Mike Mulvahill (WMU 7-21 and WMU 7-20) (AXYS 2001a).

In Alberta, four outfitters operate in WMU 455; however, it is believed that these outfitters use the nearby Kakwa and Wilmore Wilderness Areas, which are south of the proposed RoW (AXYS 2001a).

10.1.1.5 Trapping

The area of Alberta and BC crossed by the proposed pipeline RoW is home to a variety of commercially harvested furbearers including, but not limited to, marten, fisher, lynx, coyote, wolf, fox and beaver. There are five registered trapping areas on the BC side that are located adjacent or close to the proposed RoW. There are seven Registered Fur Management Areas (RFMA) on the Alberta side, all of which overlap the proposed RoW (AXYS 2001a).

In BC, the most commonly trapped species in WMU 7-19 is marten, followed by beaver and squirrel. Other species also taken, but with less frequency, include muskrat and weasel. In Alberta, the most commonly trapped species include red squirrel, muskrat, and marten (AXYS 2001a).

10.1.1.6 Consumptive Recreational Use

Other than hunting, the only consumptive recreational activity that takes place in the vicinity of the proposed RoW is recreational fishing. The rivers and lakes in the BC and Alberta portions of the proposed Project offer world class fishing for lake char, northern pike, walleye, arctic grayling, bull trout, rainbow trout, mountain whitefish, yellow perch, brook trout, brown trout, cutthroat trout, and lake trout. All lakes and waterways in the vicinity of the proposed RoW, except for Belcourt Lake, are open for sport fishing within provincial seasons and regulations (AXYS 2001a).

10.1.1.7 Non-Consumptive Recreational Use

The proposed RoW traverses areas that support numerous non-consumptive outdoor recreational activities such as hiking, camping, scenic and wildlife viewing, kayaking, canoeing, mountain biking, cross-country skiing, use of snowmobiles, and use of ATVs (AXYS 2001a). Accessible recreation opportunities are vast due to increased development of roads and seismic lines for oil and gas exploration. Non-consumptive recreational activities can take place during any season of the year, in the vicinity of the proposed RoW. The area on both the BC and Alberta side of the proposed RoW is considered valuable for non-consumptive recreational use due to scenic quality, variety and abundance of fish and wildlife, good access, and terrain features (Dawson Creek LRMP 1999).

In BC, access to the pipeline route is via the Heritage Highway from Tumbler Ridge. In Alberta, access is via the main Highway 40 from Grande Prairie, connecting to secondary Highway 666 and the Two Lakes Road, which is currently used by Weyerhaeuser and serves as an access road to the Two Lakes Recreation Site south of the proposed route. Weyerhaeuser has developed some access off the Two Lakes Road.

The all-season Wapiti and Red Deer Forest Service Roads are used for forestry and oil and gas activity and by the public for hunting and recreational use. Southeast of the Belcourt River, the existing all-season road is not as heavily used at the present time as there is currently no active logging and no drilling in the local area. Off-highway vehicles are used on existing pipeline RoWs, seismic lines and trails and predominantly in the fall during hunting season. Use of groomed snow trails by snowmobiles occurs in the winter months. There are many snowmobile trails in the area south of the RoW leading into the Belcourt area. Non-vehicular trails, other than the Wapiti-Onion Trail system, are not mapped.

The area east of the Huguenot Creek crossing is less accessible to most vehicles as the creek must be forded because the bridge has been removed. The segment southeast of the Huguenot Creek crossing spans the British Columbia-Alberta border and the Narraway River. Some seismic lines and trails can be found in this area, which are used mainly by outfitters and horses and by snowmobilers. There is no bridge across the Narraway at the proposed crossing location. Weyerhaeuser is building a permanent bridge located approximately 40 km upstream of the proposed water crossing location.

10.1.1.8 Parks and Protected Areas

No designated or proposed provincial parks, protected areas, or recreation areas are found along the proposed pipeline RoW. The closest park to the proposed route is Two Lakes Provincial Recreation Area in Alberta, a 1,566 ha recreation area located south of the Alberta segment of the pipeline. Two secondary roads, the Two Lakes Road and the Torrens Lookout Road, are located within the recreation area and also support industrial uses.

Also in Alberta, located about 8 km south of the proposed route, the Kakwa Wildland Provincial Park is the only designated Special Places site in the vicinity of the Project. This site represents critical wildlife habitat and supports various levels of recreational use including camping, fishing, hiking, hunting, and trail riding.

10.1.2 Boundaries

10.1.2.1 Spatial Boundaries

Spatial boundaries for the assessment of Project-related and cumulative environmental effects vary according to land use activity, the context of which is provided in Figure 10-1.

For commercial timber harvesting, spatial boundaries include the Dawson Creek Forest District for the portion of the proposed pipeline that will be located in BC, and Forestry Management Unit G3 (P) for the portion of the proposed pipeline that will be located in Alberta.

For energy resource exploration and development, spatial boundaries take into consideration the direct disturbances as a result of construction of the RoW and to associated access roads, and regional, overlapping disturbances caused by multiple energy resource developments and associated access roads along the pipeline and lateral corridors and in the core security habitat area (Section 9).

With respect to hunting and guide outfitting, spatial boundaries include the Wildlife Management Units and registered guide outfitting areas that overlap the RoW in BC and in Alberta.

With respect to trapping, spatial boundaries include the Wildlife Management Units and Registered Fur Management Areas that overlap the RoW in BC and in Alberta.

With respect to recreational activities, spatial boundaries include direct disturbances as a result of construction of the RoW, and a buffer zone of 500 m on either side of the RoW. Visual and other sensory disturbances during construction are generally not anticipated to occur outside of the 500 m buffer.

10.1.2.2 Temporal Boundaries

Environmental effects of Project-related activities and cumulative environmental effects on existing land use activities can occur during construction and commissioning, operation and maintenance, and decommissioning and abandonment. As well, environmental effects can occur as a result of malfunctions, accidents, and unplanned events.

Construction and commissioning of the proposed pipeline are anticipated to occur over two periods commencing in July 2002 (finishing in October 2002) and fall 2002 (finishing in prior to spring break-up 2003). Presence of the cleared RoW, post-re-vegetation, is considered to be permanent, throughout the Projected 40-year life of the Project. Decommissioning and abandonment have been considered as possible future events. The duration of the decommissioning and abandonment phases will be similar to the construction phase. Malfunctions, accidents and unplanned events can occur at any time during the life of the proposed pipeline.

10.1.2.3 Administrative Boundaries

In BC and Alberta, development occurring on public lands must be approved by provincial government agencies and must conform to current land use planning guidelines. These guidelines are identified in Land and Resource Management Plans (LRMPs) in BC and in subregional Integrated Resource Use Plans (IRPs) in Alberta. The BC segment of the proposed pipeline is located within the area of the Dawson Creek LRMP. The Alberta portion of the Project falls within Municipal District (MD) 16, the MD of Greenview. There is no subregional IRP covering the Alberta portion of the proposed Project; however, there is a regional level initiative, the Northern East Slopes Sustainable Resource and Environmental Management Strategy (NES Strategy), that applies to the Alberta portion of the proposed Project (AENV 2000). Terms of Reference have been set for the NES Strategy and an Interim Report has been prepared with regional vision and goals and identification of next steps. The NES Strategy will evolve as an important tool for planning and managing regional resource development.

Additionally, the pipeline crosses the Narraway River ESA. The West Central Caribou Standing Committee is a multi-stakeholder body in Alberta which develops guidelines for industrial activity on caribou range.

10.1.3 Residual Environmental Effects Rating Criteria

The development of residual environmental effects rating criteria for existing land use activities required the consideration of a number of factors, particularly:

- the proposed Project is compatible with existing land use plans and objectives in BC and in Alberta; and
- the construction phase of the Project, where most disturbance will occur, will be short in duration, and highly transitory in nature.

The development of the residual environmental effects rating criteria was based on knowledge of existing land uses in the vicinity of the Project and the professional judgement of the study team. The residual environmental effects rating criteria for the evaluation of significance of environmental effects on existing land use is:

A *significant residual environmental effect* is one that remains unacceptable to users or may not meet the strategic goals and management options in British Columbia (Dawson Creek LRMP) and Alberta and conditions cannot be restored to acceptable levels within one year.

A *not significant residual environmental effect* is one that may be unacceptable to users but is not outside the strategic goals and management options in British Columbia (Dawson Creek LRMP) and Alberta and would not persist for more than one year.

The one-year time frame was selected by the study team because it was assumed that the majority of potential Project-related environmental effects on Land Use would be primarily related to the construction and commissioning phase, or as a result of a malfunction, accident, or unplanned events. The activities in each phase of the Project are temporary short-term and would likely not last for more than one year; therefore, potential adverse Project-related environmental effects on Land Use are not expected to last more than one year. Environmental effects that would persist beyond such temporary or short-term periods would not likely be acceptable to users; that is, users might accept temporary inconveniences but not long-term interference at unacceptable levels.

10.1.4 Evaluation of Project-related Environmental Effects

10.1.4.1 Potential Interactions

The potential interactions of Project activities with existing land use activities are identified in Table10-1.

As described in Table 5-3, four general categories of environmental effects on Land Use can occur as a result of Project activities. They include:

- A change in user opportunity (*e.g.*, change in recreational opportunities, change in forest harvesting patterns, change in energy resource exploration and development activities, change in hunting, guide outfitting, or trapping activities, and a change in access to areas where these activities occur);
- A change in renewable resource capacity (*e.g.*, change in the amount of merchantable timber that can be harvested for sale);
- A change in visual quality (*e.g.*, change in the visual appearance or value of the landscape); and
- A change in access to resources (*e.g.*, increased or decreased access to resources relevant to hunters, trappers, guide outfitters, recreational users, energy resource developers, and forestry companies).

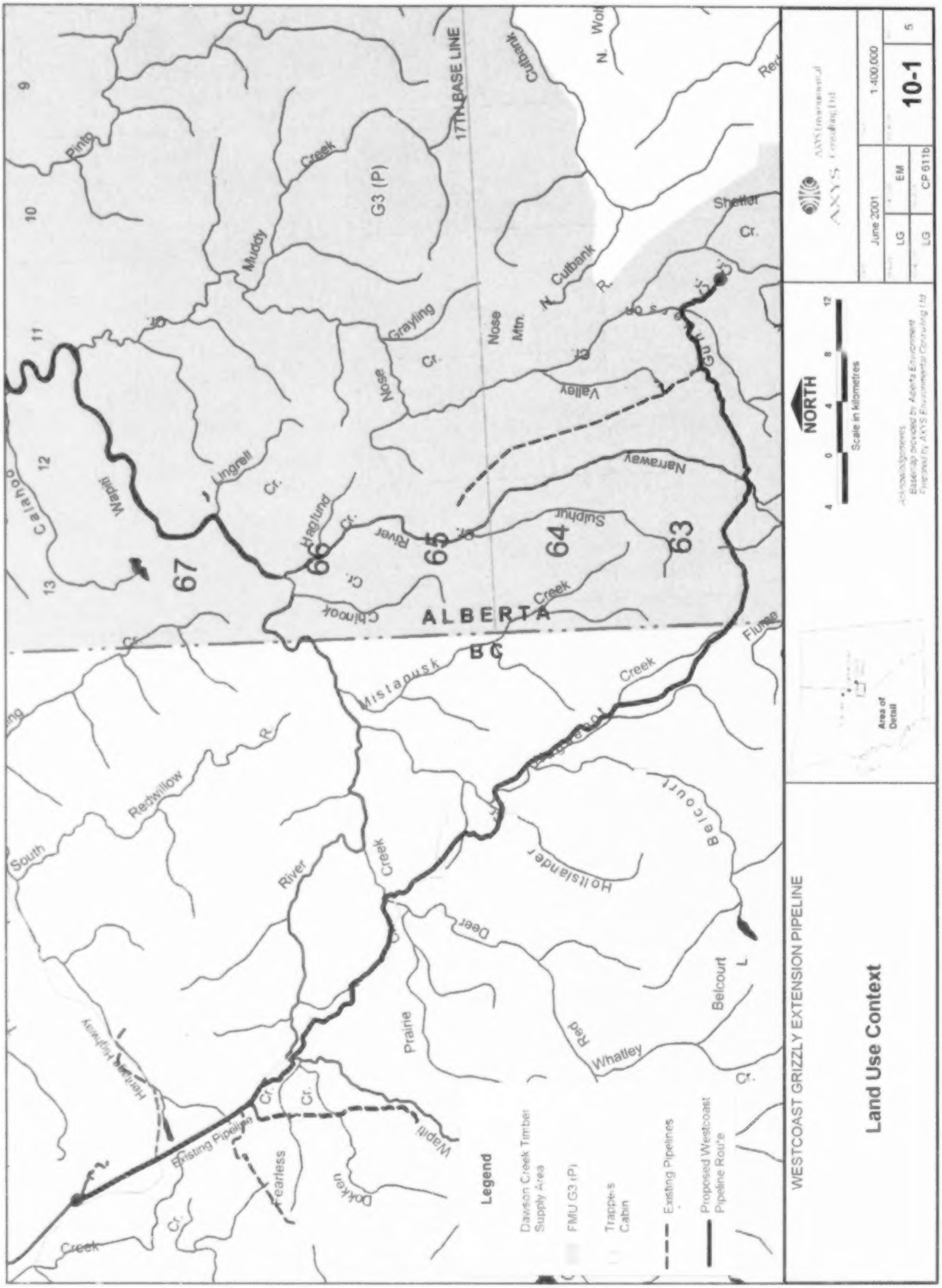
Land Use Context
WESTCOAST GRIZZLY EXTENSION PIPELINE
Legend
Dawson Creek Timber Supply Area
FMU G3 (P)
Trappers Cabin
Existing Pipelines
Proposed Westcoast Pipeline Route
NORTH
0 4 8 12
Scale in Kilometres
Acknowledgements
Basemap provided by Alberta Environment
Prepared by AXYS Environmental Consulting Ltd
Area of Detail
AXYS Environmental Consulting Ltd
June 2001
LG
EM
LG
CP 611b
1:400,000
10-1
5
ALBERTA
BC
17TH BASE LINE
G3 (P)
67
66
65
64
63
9
10
11
12
13
Wapiti
Pinto
Calahoo
Muddy
Creek
Grayling
Cr.
Nose
Nose Mtn.
N. Cutbank
R.
Cutbank
N. Wolf
Red
Shelter
Cr.
Lingrell
Cr.
Haglund
Cr.
River
Sulphur
Narraway
Valley
Chinook
Cr.
Creek
Flume
Mistanusk
Creek
South
Redwillow
R.
River
Creek
Belcourt
Hollslander
Deer
Belcourt
L.
Prairie
Red
Whatley
Cr.
Heritage Highway
Existing Pipeline
Fearless
Dokken
Wapiti
Cr.
Cr.
Cr.
Creek

Table 10-1
Potential Interaction of the Project with Land Use

Project Activities and Physical Works	Potential Environmental Effects			
	Change in user opportunity	Change in renewable resource capacity	Change in visual quality	Change in access to resources
Construction and Commissioning				
Access Development	✔			✔
Right-of-way Preparation	✔	✔	✔	✔
Mainline Construction	✔			✔
Clean-up	✔			
Testing	✔			
Operation and Maintenance	✔			✔
Decommissioning and Abandonment	✔			✔
Accidents, Malfunctions and Unplanned Events				
Pipeline rupture/leak	✔			✔
Public accidents	✔			
Vehicle collisions	✔			
Forest/bush fire	✔	✔	✔	✔
Spill or accidental release of hazardous materials	✔			
Loss of containment during water crossing(s)	✔			
Public access	✔	✔		✔

Construction and Commissioning

Potential environmental effects are associated with the construction and commissioning phase of Project development, and with accidents and malfunctions, where and when they may occur. Construction of the pipeline will proceed rapidly and will be mobile and transitory in nature. It is anticipated that approximately 0.5 to 1 km/day of pipeline will be laid over the construction schedule. Associated environmental effects during construction will be temporary at any particular location along the pipeline route, although residual changes in visual quality will be evident throughout the life of the Project in areas particularly where the pipeline does not follow an existing RoW.

Operation and Maintenance

Potential environmental effects during operation include increased access provided by the RoW and any access roads left in place. Westcoast will implement access control measures at the conclusion of the construction and commissioning phase to deter uncontrolled public access to the RoW during the operation and maintenance phase. Access by public users during operations and maintenance (*i.e.*, access controls) is addressed as an unplanned event. Access management strategies and access control measures is provided in the Access Management Plan (EPP, Appendix 3).

Decommissioning and Abandonment

Potential environmental effects during abandonment will be similar to the environmental effects realized during construction and commissioning. Abandonment activities will likely proceed quickly, over a short period of time and will be transitory in nature. During decommissioning activities, there would be little interaction with existing land uses, and, therefore, no substantive potential environmental effects, including cumulative effects, would result.

Accidents, Malfunctions, and Unplanned Events

Potential environmental effects are also associated with accidents, malfunctions, and unplanned events. Accidents, malfunctions, and unplanned events are unlikely, but if they occur, are anticipated to be localized and short term in duration. Procedures to deal with construction and maintenance-related accidents, malfunctions, and unplanned events will be provided in the on-site Emergency Response Plan (ERP) (Section 2.1.9.4). Procedures outlining Spill and Fire Response are provided in Section 16.0 of the EPP.

As noted earlier, access management measures are detailed in the Access Management Plan (EPP, Appendix 3)

Analysis and discussion of mitigation measures for all Project-related environmental effects are addressed in the following sections.

10.1.4.2 Environmental Effects Analysis

10.1.4.2.1 Construction and Commissioning

Environmental effects on existing land uses that may occur as a result of construction and commissioning include changes in user opportunities, changes in renewable resource capacity, change in visual quality, and change in access to resources (Table 10-2).

Commercial Forest Harvesting

The specific issue of concern for timber harvesting is the change in renewable resource capacity due to loss of productive forest land base and merchantable timber as a result of clearing the RoW. The amount of RoW to be cleared has been minimized through route selection, to use areas that have already been cleared as much as practical. The volume of timber that will be removed from the RoW is estimated to be 27,000 m^3, approximately 1.5% of the current AAC. Merchantable timber will be salvaged from the cleared vegetation to be sold by the appropriate forestry licensee and considered part of that year's AAC. The RoW traverses approved cutblocks under the SBEP (where the pipeline parallels existing forest service roads between Red Deer and Belcourt Creeks) and Chetwynd Forest Industries (in the vicinity of KP 32). Timber harvesting for RoW clearing will be coordinated with provincial authorities and licensees to ensure it is accounted for in the annual cutting plan for 2002. In addition, agreements regarding the use of forestry roads for construction access will be negotiated with relevant authorities and activities will be coordinated with forestry operators active in construction areas.

Table 10-2
Environmental Effects Assessment Matrix: Land Use – Construction and Commissioning

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Access development	Change in access to resources (A) (P)	Access Management Plan (EPP)	1	2	1/4	R	2
	Change in user opportunity (A) (P)	Access Management Plan (EPP)	1	2	1/4	R	2
Right-of-way preparation	Change in user opportunity (A)	Other industrial users will be notified of timing of construction activities; vehicle trips will be minimized by using buses to transport personnel to work sites; speed limits will be strictly observed; RoW clearing will be minimized where possible; temporary access will be removed during reclamation; Access Management Plan; (EPP)	1	2	1/4	R	2
	Change in renewable resource capacity (A)	Timber salvage plan; :work space, temporary access, selected habitat areas will be reclaimed.	1	2	1/4	R	2
	Change in visual quality (A)	RoW will be reseeded after backfilling; dust control measures; use of vegetation and dog-legs to remove line-of-sight; minimize the amount of RoW cleared; workspace, temporary access, selected habitat areas will be reseeded.	1	2	1/4	R	2
	Change in access to resources (A)	Schedule construction activities to avoid other users; Access Management Plan (EPP) (e.g., visual screening, use of gates and berms, slash rollback, removal of watercourse vehicle crossings following construction); temporary access will be removed during reclamation	1	2	1/4	R	2
Mainline construction	Change in user opportunity (A)	Notification of timing of construction activities to other industrial users; dust control measures	1	2	1/4	R	2
	Change in access to resources (A)	Access Management Plan (EPP)	1	2	1/4	R	2
Reclamation	Change in user opportunity (A)	Remove temporary access; Access Management Plan (EPP)	1	2	1/4	R	2

<table>
<tr><th rowspan="2">Project Activity</th><th rowspan="2">Potential Positive (P) or Adverse (A) Environmental Effect</th><th rowspan="2">Mitigation</th><th colspan="5">Evaluation Criteria for Assessing Environmental Effects</th></tr>
<tr><th>Magnitude</th><th>Geographic Extent</th><th>Duration/ Frequency</th><th>Reversibility</th><th>Socio-Cultural / Ecological Context</th></tr>
<tr><td>Testing</td><td>Change in user opportunity (A)</td><td>Access Management Plan (EPP)</td><td>1</td><td>2</td><td>1/4</td><td>R</td><td>2</td></tr>
<tr><td colspan="2">KEY
Magnitude:
1 = Low: one or more existing land use activity affected for a period of less than one year.
2 = Moderate: one or more existing land use affected for a period of more than one year, but less life of the Project.
3 = High: one or more existing land use affected for a period of time that exceeds the life of the Project or is irreversible.</td><td>Geographic Extent:
1 = <1 km²
2 = 1-10 km²
3 = >10 km²
Duration:
1 = < 1 month
2 = >1 month but <1 year
3 = >1 year</td><td colspan="2">Frequency:
1 = < 10 events/year
2 = 11-50 events/year
3 = 51-100 events/year
4 = continuous
Reversibility:
R = Reversible
I = Irreversible</td><td colspan="3">Socio-Cultural/Ecological Context:
1 = Area is relatively pristine or not adversely affected by human activity.
2 = Evidence of adverse environmental effects
N/A = Not Applicable</td></tr>
</table>

Energy Resources Exploration and Development

Energy resources exploration and development may be temporarily disrupted due to construction activities. Pipeline construction and commissioning will not likely disturb other oil and gas operators in the area. Gas production and transmission facilities constitute the majority of the industrial infrastructure encountered by the proposed route (as well as forestry access roads). To minimize potential disruptions to other producers, energy companies with dispositions that would be intersected by the RoW will be contacted by Westcoast. In addition, the use of shared RoWs without interfering with existing operations will be maximized.

Hunting

Short-term disturbance on a local scale to hunting activities may occur in the immediate vicinity of the construction activities due to the presence of heavy equipment and workers in the area. These environmental effects would be restricted to the construction phase; however, this period will likely overlap with the fall 2002 big game hunting season. Existing access for hunting would remain open; therefore, there would be no loss of user opportunity for hunting activities. As discussed in the wildlife sections, although wildlife will likely be displaced from the immediate Project area due to sensory disturbances associated with construction activities, the residual environmental effects associated with disturbance and temporary loss of habitat on wildlife are expected to be not significant. It can therefore be concluded that hunting success would not substantially decrease as a result of the construction and commissioning phase of the Project.

Guide Outfitting

The activities of registered guide outfitters will be temporarily disrupted during the construction and commissioning phase of the Project. Wapiti River Outfitters, the only outfitting company operating in the area, has indicated that construction activities in the vicinity of their base camp may lead them to decide to abandon use of this camp for the fall hunting season. The base camp will be re-established immediately following construction activities, thus restoring the area to its pre-construction use within a year. Access to existing hunting areas will not be blocked.

Trapping

Short-term disturbance on a local scale to furbearing animals and trapping activities will occur in the immediate vicinity of the construction activities due to the presence of heavy equipment and workers in the area, and following construction as a result of alterations to furbearer habitat. Marten is among the most commonly trapped furbearers. As discussed in the wildlife sections, the residual environmental effects on marten are predicted to be not significant; therefore, there will not be a substantial decrease in trapping success for marten. Environmental effects on trapping activities will be temporary and will be restricted to the construction and commissioning phase. Construction activities occurring during the fall or winter months will overlap with part of the trapping season. Registered trappers will be notified of construction activities and will be contacted at least two weeks prior to clearing to permit relocation of trap sets, fur caches and other equipment, if necessary. Westcoast will compensate registered trappers that experience short-term disruption and costs associated with direct disturbances such as moving traps and repair of trails as a result of construction and commissioning activities. Existing access for trapping will not be reduced or altered by Project-related activities.

Mining, Exploration and Development

There will be no overlap or disruption to mine-related prospecting and development activities as a result of Project-related construction activities.

Non-Consumptive Recreational Users

There may be some short-term disruption to recreational opportunities during the construction phase of the Project. Westcoast will notify all industrial, commercial, and known recreational users in the area of the timing of construction activities to avoid and/or minimize conflicts and to ensure public health and safety (particularly around heavy equipment). In the future, recreational land uses are expected to occur at similar levels to the present, despite the presence of the proposed pipeline.

Visual quality of the landscape may be adversely affected by the construction of the pipeline; however, the decrease in visual quality will be limited to the RoW and will be minimized through measures such as vegetation screens or by using dog-legs down the corridor to reduce line-of-sight environmental effects. The amount of RoW to be cleared has been minimized by using disturbed areas as much as possible. Reclamation of the RoW at the conclusion of the construction phase will reduce the visual intrusion of the RoW.

The proposed Project is compatible with area-specific land use plans and objectives in BC and Alberta.

Based on the key to Table 10-2, residual adverse environmental effects of construction activities on land use activities will be low in magnitude, extent and duration. The frequency of some construction activities that conflict with existing land uses will be high during the construction as this it the most intensive phase of the Project. Where residual adverse environmental effects are predicted to occur on existing land uses, they will be reversible. As the environmental effects of construction and commissioning will not remain unacceptable to users for more then one year and do not conflict with land use management strategies, the residual environmental effects of construction and commissioning on land use are rated not significant.

10.1.4.2.2 Operation and Maintenance

Environmental effects during operations and maintenance could result in changes in user opportunities and access to resources (Table 10-3).

Table 10-3
Environmental Effects Assessment Matrix: Land Use – Operation and Maintenance

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Operation	Change in User Opportunity (A) (P)	Access Management Plan (EPP)	1	2	1/4	R	2
	Change in Access to Resources (A) (P)	Access Management Plan (EPP)	1	2	1/4	R	2
KEY Magnitude: 1 = Low: one or more existing land use activity affected for a period of less than one year. 2 = Moderate: one or more existing land use affected for a period of more than one year, but less life of the Project. 3 = High: one or more existing land use affected for a period of time that exceeds the life of the Project or is irreversible.		Geographic Extent: 1 = <1 km² 2 = 1-10 km² 3 = >10 km² Duration: 1 = < 1 month 2 = >1 month but <1 year 3 = >1 year	Frequency: 1 = < 10 events/year 2 = 11-50 events/year 3 = 51-100 events/year 4 = continuous Reversibility: R = Reversible I = Irreversible			Socio-Cultural/Ecological Context: 1 = Area is relatively pristine or not adversely affected by human activity. 2 = Evidence of adverse environmental effects N/A = Not Applicable	

Access

The potential environmental effect of the Project on regional access patterns is a key factor contributing to Project-related environmental effects on land use during operation and maintenance. The discussion of access relates to all of the existing land uses outlined in 10.1.1 that could potentially be affected during the operation and maintenance phase of the Project.

In response to the concerns of various stakeholders, Westcoast has developed a comprehensive long-term access management strategy embodied in the Access Management Plan (EPP, Appendix 3). Following construction, Westcoast will deter public access along the pipeline RoW using techniques such as timber rollbacks, berms, vegetation barriers and leaving stands of timber by use of directional drills or boring. Westcoast will also remove access trails and reclaim parts of the RoW through re-seeding and selective plantings (EPP, Section 8.0, Clean-Up and Revegetation, EPP, Appendix 3, Access Management Plan; see Environmental Alignment Sheets for specific locations is included in Westcoast's revised draft CSR, dated January 4, 2002). The effectiveness of control measures will be monitored and improvements made as necessary. Access management is intended to sustain existing access without inducing new levels of access into areas that have been relatively undisturbed to date. The proposed mitigation measures and adaptive management approach to monitoring the effectiveness of the access management measures is intended to result in little change to existing patterns of access.

Commercial Timber Harvesting

The volume of timber that will be removed to clear the RoW during construction was estimated at 27,000 m^3, approximately 1.5% of the current ACC. The majority of the RoW will remain cleared during the operation and maintenance phase of the Project keeping the area unavailable for re-growth and commercial timber harvesting during this phase. As noted previously, the RoW will be allowed to recover to its natural state after abandonment and support commercial timber harvesting once the trees have reached maturity. Therefore, in the long-term, the effect on commercial timber harvesting will be reversible.

Energy Resource Development

Although the access management measures proposed for the Project are intended to keep existing patterns of access unaltered, the existence of the Project will encourage energy resource development in the vicinity of the pipeline RoW. Exploration and production companies are increasing activity in the area, knowing that the proposed Project will transport gas to processing facilities and eventually to market.

Hunting, Guide Outfitting, Trapping

As described in the Access Management Plan and Caribou Protection Plan Westcoast will work through its adaptive access management strategy, and with the relevant provincial authorities, First Nations, and other industrial users in the area, to coordinate access in the region with the aim of minimizing the effects of access on wildlife and consequently to related human use of wildlife for hunting, trapping and guide outfitting.

Non-Consumptive Recreational Use

Decreased visual quality as a result of the cleared RoW may persist during the operation and maintenance phase. In addition to the visual design features noted in Section 10.1.4.2.1, Westcoast will implement post-construction monitoring to ensure the success of reclamation on the RoW and selected replanting areas. Reclamation and re-vegetation measures will be adjusted accordingly as a result of post-construction monitoring if they do not prove to be completely effective.

Based on the key to Table 10-3, residual adverse environmental effects on land use activities will be low in magnitude and extent. Positive environmental effects on energy resource development will also occur due to improved or coordinated access. When residual adverse environmental effects are predicted to occur on existing land uses over the long term, they will be reversible. As it is unlikely that the environmental effects of operation and maintenance will preclude existing land uses and since operation and maintenance activities do not conflict with land use management strategies, the residual environmental effects of operation and maintenance are rated not significant.

10.1.4.2.3 Decommissioning and Abandonment

Environmental effects on existing land uses that may occur as a result of decommissioning and abandonment activities include changes in user opportunities and changes in access to resources (Table10-4).

Table 10-4
Environmental Effects Assessment Matrix: Land Use – Decommissioning and Abandonment

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Decommissioning and abandonment	Change in user opportunity (A)	Timing and notification of activities	1	2	1/1	R	2
	Change in visual quality (P)	Timing and notification of activities; revegetation; removal of access	1	2	1/1	R	2
KEY Magnitude: 1 = Low: one or more existing land use activity affected for a period of less than one year. 2 = Moderate: one or more existing land use affected for a period of more than one year, but less than the life of the Project. 3 = High: one or more existing land use affected for a period of time that exceeds the life of the Project or is irreversible.		Geographic Extent: 1 = <1 km² 2 = 1-10 km² 3 = >10 km² Duration: 1 = < 1 month 2 = >1 month but <1 year 3 = >1 year	Frequency: 1 = < 10 events/year 2 = 11-50 events/year 3 = 51-100 events/year 4 = continuous Reversibility: R = Reversible I = Irreversible		Socio-Cultural/Ecological Context: 1 = Area is relatively pristine or not adversely affected by human activity. 2 = Evidence of adverse environmental effects N/A = Not Applicable		

Pipeline decommissioning involves activities similar to maintenance, but would occur over a short period of time. The pipeline will be cleaned, prepared for in-ground containment and capped. There would be very little interaction between decommissioning activities and existing land use activities, and therefore, no substantive potential environmental effects.

Abandonment involves activities similar to construction, in that the pipeline, after it has been cleaned, may in some section be removed from the ground, and the overall RoW will be reclaimed. Abandonment activities may result in short term disruption of existing land uses in the area; however, Westcoast will notify existing users, where possible, of the timing of pipeline abandonment activities to avoid and/or minimize conflict. The likelihood that the pipeline would be abandoned in the foreseeable future is low.

After abandonment, the RoW will be allowed to recover to a natural state and will be available for timber harvesting once trees have reached maturity, and hence environmental effects of decreased timber harvest are reversible. Environmental effects on the capacity of the renewable forest base to meet the needs of the present will be minimized, and the capacity of regional forest resources to meet the needs of the future will eventually be restored to pre-construction levels. Future timber harvesting will be managed under applicable provincial timber management regulations and strategies, at planned levels in keeping with current principals of sustainable forest management and in a manner consistent with applicable land management plans.

Based on the key to Table 10-4, residual adverse environmental effects of decommissioning and abandonment on land use activities will be low in magnitude, extent and duration. When residual adverse environmental effects are predicted to occur on existing land uses, they will be reversible. As the environmental effects of decommissioning and abandonment will not remain unacceptable to users for more then one year and do not conflict with land use management strategies, the residual environmental effects of decommissioning and abandonment are rated not significant.

10.1.4.2.4 Accidents, Malfunctions and Unplanned Events

Environmental effects on existing land uses that could occur as a result of malfunctions, accidents, or unplanned events include changes in user opportunities, changes in access to resources, changes in renewable resource capacity, and changes in visual quality (Table 10-5).

Malfunctions, accidents and unplanned events are difficult to predict, but when and if they occur, they will be short term in duration and localized, except perhaps for highly unlikely circumstances. The likelihood of an extensive Project-related forest fire is low because of planned mitigation and existing measures in place by other users and resource agencies.

The Project-specific contingency plans in Section 16 of the (EPP, Spill Response Plan, Fire Contingency Plan, Drilling Mud Release Contingency Plan, and Emergency Response Plan) will provide procedures to address accidents, malfunctions, and unplanned events. The results of accidents, malfunctions, and unplanned events will be contained, controlled, and/or clean-up immediately. Therefore, residual adverse environmental effects of accidents, malfunctions, and unplanned events are predicted to be not significant as they are not expected to result in long-term environmental effects beyond one year in the unlikely event that they should occur.

It is possible that unplanned access by public users will occur during construction and commissioning activities and/or during operation and maintenance. Mitigation measures to minimize unplanned access, such as signage and physical barriers, will be placed along sections of the RoW that must be kept open for construction purposes and for ongoing maintenance activities. Following construction, earthern berms and timber rollback will be used to block public access along the RoW. Unplanned public access is expected to be short-term and low magnitude; however, access could inadvertently be provided to a large geographic area, particularly if access is gained via ATV. Effectiveness of access control measures will be systematically monitored and corrective measure taken where control measures are found to be ineffective. Westcoast's engagement in coordinated regional access planning process and ongoing consultation with other users in the area will also support the effectiveness of the Access Management

Table 10-5
Environmental Effects Assessment Matrix: Land Use – Accidents, Malfunctions, and Unplanned Events

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Pipeline rupture/leak	Change in user opportunity (A)	ERP	1	1	1	R	2
	Change in access to resources (A)	ERP	1	1	1	R	2
Public accidents	Change in user opportunity (A)	ERP	1	1	1	R	2
Vehicle collisions	Change in user opportunity (A)	ERP	1	1	1	R	2
Forest/brush fire	Change in user opportunity (A)	Fire Contingency Plan FCP (EPP); ERP	1-3*	2	1	R	2
	Change in renewable resource capacity (A)	FCP (EPP); ERP	1-3*	2	1	R	2
	Change in visual quality (A)	FCP (EPP); ERP	1-3*	2	1	R	2
	Change in access to resources (A)	FCP (EPP); ERP	1-3*	2	1	R	2
Spill or accidental release of hazardous material	Change in user opportunity (A)	Spill Contingency Plan (SCP) (EPP); ERP	1	1	1	R	2
Unplanned public access	Change in user opportunity (A)	Access Management Plan (EPP); ERP	1	3	1	R	2
	Change in renewable resource capacity (A)	Access Management Plan (EPP); ERP	1	3	1	R	2
	Change in access to resource (A)	Access Management Plan (EPP); ERP	1	3	1	R	2

KEY

Magnitude:
1 = Low: one or more existing land use activity affected for a period of less than one year.
2 = Moderate: one or more existing land use affected for a period of more than one year, but less life of the Project.
3 = High: one or more existing land use affected for a period of time that exceeds the life of the Project or is irreversible.

Geographic Extent:
1 = <1 km²
2 = 1-10 km²
3 = >10 km²

Duration:
1 = < 1 month
2 = >1 month but <1 year
3 = >1 year

Frequency:
1 = < 10 events/year
2 = 11-50 events/year
3 = 51-100 events/year
4 = continuous

Reversibility:
R = Reversible
I = Irreversible

Socio-Cultural / Ecological Context:
1 = Area is relatively pristine or not adversely affected by human activity.
2 = Evidence of adverse environmental effects

N/A = Not Applicable
ERP = Emergency Response Plan

* The magnitude of a forest fire could vary. A high magnitude event is highly unlikely due to the provisions of the Fire Contingency Plan (FCP) and the ERP required of contractors prior to commencement of activities.

Plan. As the risk of unplanned access may be somewhat greater during the construction period (*i.e.*, until such time as access controls can be put in place), the environmental effects on Land Use associated with unplanned access will not extend beyond one year. The process of adaptive management and regional access control as proposed in the Access Management Plan will contribute greatly to minimizing the risk of unplanned access persisting beyond one year.

10.1.4.3 Summary

The Project is consistent with land use management plans and strategies in place for northeastern British Columbia and northwestern Alberta. The Project will not result in any significant adverse residual environmental effect on the activities of other industrial users, hunters, guide outfitters, trappers, or recreational users. Temporary disruption to the local guide outfitter resulting from the loss of the use of their base camp will be limited to one season. Potentially adverse environmental effects associated with unplanned public access to previously inaccessible areas will be mitigated through access control techniques such as the use of signage and barriers. There will be no significant residual adverse environmental effects associated with the decommissioning and abandonment phase of the Project.

The overall environmental effect of the Project on Land Use for all phases of the Project is considered not significant (Table 10-6), as collectively, the environmental effects of the various phases of the Project are not expected to result in significant environmental effects overall.

Table 10-6
Summary of Project-related Environmental Effects: Land Use

Phase	Residual Environmental Effects Rating
Construction and Commissioning	NS
Operation	NS
Decommissioning and Abandonment	NS
Accidents, Malfunctions and Unplanned Events	NS
Project Overall	NS

Key:
Residual environmental Effect Rating:
S = Significant Adverse Environmental Effect
NS = Not-significant Adverse Environmental Effect
P = Positive Environmental Effect

10.1.5 Cumulative Environmental Effects

Although Westcoast will endeavour to keep access patterns unaltered in the vicinity of the Project by implementing the Access Management Plan, Westcoast recognizes that unplanned access may be facilitated by the presence of the new RoW and may contribute to adverse cumulative environmental effects on existing land uses. In a multiple resource setting such as northeastern British Columbia and northwestern Alberta that supports multiple industrial, subsistence, and consumptive and non-consumptive recreational activities, conflicts as a result of increased access are inherent. Other proponents in the area of the Project are recognizing the need to coordinate access management in order to cut down on financial cost of building new access by using existing roads and trails, and to lessen the environmental effect of increased access into areas that are relatively undisturbed. Initiatives such as

Coordinated Access Management Planning through the BC Ministry of Forestry and the West and Central Caribou Standing Committee provide mechanisms to coordinate planning and assessment. As a result of this trend toward coordination of access management, Westcoast developed the Access Management Plan for this Project with a dual objective of implementing access controls along the new RoW (see Environmental Alignment Sheets for specific locations), and of coordinating access with other known users in the area over the longer term.

The issue of access management is considered to be a CEA trigger, as noted in Section 5.1.4. The issue of access and access management is also discussed in the context of other substantive cumulative environmental effects arising with respect to vegetation, wildlife habitat, and traditional land use.

Westcoast anticipates that the implementation of the site-specific tools in the Access Management Plan, along with ongoing coordination of activities and access with other known users in the area, will be an effective long-term regional strategy to address potential cumulative environmental effects of access on land use activities. The Access Management Plan commits Westcoast to a process of adaptive management and provides for Westcoast to undertake a stewardship role in initiating discussions regarding regional access management. Westcoast will embrace this role by demonstrating and sharing the results of its adaptive management strategy with other known users in the area, and by providing an example of leadership with other users and regulatory authorities, in particular, producers that will be developing wells in the area and piping in to the Grizzly Extension Pipeline. Therefore, with the implementation of the Access Management Plan and with Westcoast's commitment to coordinate ongoing activities with other known users in the area, the Project is not predicted to contribute substantively to adverse cumulative environmental effects on existing land use in the region. Any such adverse cumulative environmental effects are expected to be not significant.

10.1.6 Monitoring and Follow-Up

The EPP Contingency Plan (Section 16) will require systematic documentation of all accidents and malfunctions by the Chief Inspector, Environmental Inspector (on-site during construction) or other authority specifically designated by the respective plans and prompt reporting to the relevant environmental protection authority in BC or Alberta, or federally (*i.e.*, DFO).

With respect to access management, Westcoast has committed to a process of adaptive management, including monitoring of the effectiveness of access management measures. The post-construction monitoring program will involve visual inspections of the pipeline RoW for winter (*i.e.*, snowmobile) and summer (*i.e.*, ATV) vehicular tracks. Inspections will occur during regular operation over-flights. In addition to visual inspections of human RoW use, Westcoast will conduct a RoW us study as described in Section 15.1.3.2. In addition to the Project-specific access management measures, Westcoast will maintain ongoing communication with other resource users and agencies in the northeastern region of British Columbia and northwestern region of Alberta with the objective of coordinating access development and ensuring consistent standards of access management by all users to achieve land use and wildlife habitat protection goals. The results of access monitoring will be shared with other users and regulatory agencies.

A number of other issues, such as reclamation, revegetation, erosion control, and slope stability will be subject to monitoring during construction and operation (see specific sections of the EPP including

Clean-up and Revegetation, Erosion Protection, Directional Drilling Mud Release Contingency Plan, Spill Contingency Plan, Long Term Compliance Strategy, Access Management Plan, Stream Crossing Report *etc.*). The objectives of these various plans and procedures is to ensure that ongoing renewable resource capacity and associated human use of the land is not adversely affected by this Project.

10.2 Additional Submissions

10.2.1 Westcoast

Westcoast discussed the interactions between Valued Environmental Components (VEC) and the relationship between its selected VECs and other potential VECs that were proposed because of their socio-economic importance to local users. Westcoast stated that the VECs it selected include both ecosystem and social components, and that interactions occur primarily between biological VECs (fish, vegetation and wildlife) potentially affected by project activities, and land uses that depend on the biological resource base. Other land users identified were traditional users, hunters, guide outfitters, trappers, anglers, non-consumptive wilderness recreation users, and forestry. Interactions between individual VECs and traditional use are discussed in Chapter 11.

Westcoast submitted that the assessment and mitigation measures covered in Chapter 7 on fish and fish habitat, in Chapter 8 on vegetation, and in Chapter 9 on wildlife, all serve to protect valued elements identified in those chapters, for other users. Similarly, it referred to its access management plan in addressing cumulative effects and the potential for increased access in the discussion of impacts on land and resource users. This is discussed further in Chapter 15.

Westcoast stated that access to the main fish bearing streams would not change, because these streams are either already accessible, or in the case of the Narraway River, access control measures would mitigate against a change in the level or location of access to this river.

With respect to the suggestion that moose, elk and deer be considered as VECs due to their importance to local users, Westcoast noted that, among ungulates, caribou are more sensitive to the clearing of forested land and the reduction of core security habitat. Thus, the analysis of changes in core security habitat and road density for caribou can be considered a more conservative assessment of risk than would an analysis of other ungulate species. Westcoast further added that the proposed access control measures to protect caribou would also reduce mortality risk for other ungulates; that moose, elk and deer tend to benefit from the conversion of older forest communities into early successional ones; that the reclaimed right of way would represent a forage source close to cover; and that moose, elk and deer have a higher reproductive potential than caribou.

Westcoast considered the effects that impact on grizzly bear, caribou and marten would have on hunting, guide outfitting, wilderness recreation, trapping, and traditional use. It submitted that, because the contributions of the pipeline to existing cumulative pressures on grizzly bear and caribou core security habitat are not expected to significantly affect the mortality risk levels for these species in the region, the Project is not expected to affect hunting, guide outfitting, and wilderness recreational opportunities. As for marten, the objective of the access management plan is to impede development of any new access patterns which may result in mortalities or disturbance to habitat. Accordingly, it is not anticipated that project environmental effects on marten will have any long term adverse effects on trapping activities.

With respect to the question of whether regional population level information on wildlife is appropriate in assessing area specific impacts on wildlife and thus impacts on local use, Westcoast noted that wildlife data at the population level provides information on regional trends in abundance as well as resource use. While impacts may occur at a specific location, it is expected that regional wildlife populations may mitigate this impact by providing a source population for the impacted area (e.g., through recolonization). Westcoast also stated that the management of wildlife resources occurs at the regional level and resource managers can use population level information for wildlife to determine appropriate management strategies.

Westcoast acknowledged that the clearing of vegetation would affect the productive forest land base for the life of the Project. However, clearing would be minimized and merchantable timber would be salvaged. In the longer term, forests would become re-established, first on the reclaimed portions of the right of way not subject to vegetation management. Eventually, after decommissioning, the full right of way would be returned to the forest land base. Westcoast stated that its Timber Salvage Plan/Timber Harvesting and Management Plan (Plan) will be completed following completion of the summer 2002 timber cruise. The Plan is being developed in consultation with B.C. and Alberta forestry officials and will be consistent with their respective forest management and land use requirements and practices. Once completed, Westcoast will submit the Plan to the Board.

In response to local concerns about the impact of the Project on wilderness based businesses, Westcoast concurred with the District of Tumbler Ridge that wilderness areas have an economic value as wilderness areas and that there would be some marginal effect on wilderness areas from the extraction of resources, or from a pipeline going through a previously undeveloped area.

Westcoast pointed out that as a multi-use area, the region is open for oil and gas activity as well as to other users and that it is the B.C. government, not Westcoast or the oil and gas industry, who determines the appropriate balance between resource extraction and its environmental footprint, or between different economic opportunities. Westcoast emphasized that, in British Columbia, there has been an extensive land-use planning process and that the proposed pipeline route is located in a multi-use area, for which one of the objectives is the development of energy resources. Westcoast reiterated that the Dawson Creek Land and Resource Management Plan (LRMP) specifically provides for the development of oil and gas resources and that pipelines need to be built to transport the resource to markets.

Westcoast further added that there are other recreational interests that enjoy using the access of corridors such as pipeline right of ways. Nonetheless, Westcoast stated that its goal is to prevent public access on new right of way that does not have any established usage. Westcoast recognizes that others use the land base and that it, therefore, cannot simply decide to shut down all lines of access. However, it is trying to avoid creating new access potential that is not already available for motorized vehicles. Westcoast added that it is looking at opportunities for off right of way linear closures to compensate for any incremental effects that might be present after mitigation measures are applied.

More specifically, Westcoast would also be willing to discuss with Wapiti some refinements in and around the Wapiti area in terms of controlling access to the Wapiti River. It would also be willing to revisit any additional access control measures that Wapiti feel are required to address concerns for long-term recreational activities in those areas and would consider some minor routing modifications to move the pipeline facility closer to roads or other disturbances.

Finally, Westcoast committed to involve local people with local knowledge in the development and design of its access control measures.

10.2.2 Intervenors

Parties residing and working in the area expressed concern about the impact of the Project on their economic reliance on the natural environment and the availability of compensatory local economic benefits. Wapiti, Ms. Biem and Ms. Mason, raised concerns regarding the routing of the proposed pipeline, notification of land users, environmental protection, access management, education, poaching, emissions, signage, reclamation, future oil and gas activities, cumulative effects, monitoring and the impact of environmental effects of the Project on the economic success of the guide outfitting businesses.

Ms. Mason and Ms. Biem both testified that, three years earlier, in response to the closure of the mines at Tumbler Ridge, a steering committee was created to discuss sustainable development for Tumbler Ridge and that, subsequently, an ecotourism co-operative was incorporated. Ms. Mason elaborated on the commitments and efforts people have made towards this co-operative, including obtaining licenses, taking courses and volunteering, and explained how they are now starting to succeed and make some money from it. Concerns were raised that the Project would impact the wilderness qualities of the area on which ecotourism depends.

Mr. McLaughlin, the economic development officer for the District of Tumbler Ridge, stated that Mr. McLaughlin is attempting to diversify its economy by developing an ecotourism industry using the local wilderness, and that, therefore, wilderness areas have an economic value as wilderness areas, *per se*. Tumbler Ridge argued that resource extraction has an impact on the environment, on the local economy and on the quality of life of residents, and that, if these impacts are only negative and there are no benefits to local residents, this is unjust and the community would not be supportive of the Project.

Wapiti and Ms. Mason expressed their willingness to work with Westcoast regarding its access control measures. Ms. Mason also stated that she would be willing to assist Westcoast with its post-construction monitoring program and quality control measures.

10.3 Conclusions

The Project is consistent with the land-use plans for the area. The Dawson Creek LRMP provides for the development of renewable and non-renewable resources, such as oil and gas resources. While the Dawson Creek LRMP designates this as a multi-use area, it does not provide guidance on assigning priorities to conflicting interests. Consequently, it is important that parties maintain open channels of communication and address each others' concerns. Westcoast's commitment to involve local people with local knowledge in the development and design of its access control measures will serve to meet this goal.

For the purposes of this assessment the land use matters considered here address the socio-economic impacts resulting from project-related changes to the environment under the CEAA.

While Tumbler Ridge expressed concerns regarding the availability of economic benefits, this is not a factor included in the CEAA definition of environmental effect. Consequently, this will be considered under the Board's mandate under the NEB Act and will be discussed in any Reasons for Decision that may be issued by the Board.

With the mitigations proposed and commitments made by Westcoast, it is concluded that the effects of the environmental changes caused by the Project on socio-economic conditions and on renewable resources are not likely to be significant.

Chapter 11

Aboriginal Land Use And Archaeological Resources

11.1 Westcoast Submission - Revised Draft CSR - 4 January 2002

11.1.1 Existing Conditions

11.1.1.1 Aboriginal Communities and Traditional Land Use

The Project area is located within Treaty No. 8 (1899) in British Columbia and Alberta. Aboriginal communities located within the vicinity of the Project in British Columbia include: West Moberly First Nation, McLeod Lake Indian Band, Saulteau First Nations, Kelly Lake First Nations and Kelly Lake Cree Nation. In Alberta, the people of Horse Lake First Nations and the Aseniwuche Winewak Nation reside in proximity to the Project area. The Project was introduced to these Aboriginal communities in October 2000 and discussions with the communities have been ongoing since then. Landsong Heritage Consulting Ltd. (Landsong) has worked with Westcoast and the local Aboriginal communities to develop comprehensive field programs that involve a high level of Aboriginal involvement and protocols for the sharing of traditional use and archaeology information in both British Columbia and Alberta. All of the Aboriginal communities, with the exception of the Saulteau First Nations, have been actively involved in the development of an integrated traditional land use and archaeological study (TUAS). Provincial permits to conduct the archaeological assessments were obtained prior to conducting the archaeology fieldwork. No permits are required for the collection of traditional land use information.

The following is a brief description of the First Nation communities in the vicinity of the Project.

West Moberly First Nation

The West Moberly First Nation (WMFN) is located approximately 20 km north of Chetwynd, along Highway 29 at Moberly Lake. The on-reserve population grew from 51 in 1991 to 70 in 1996 and it remains at approximately this level in 2000 (Westcoast 2001a). The active labour force in the community is employed in aboriginal administration as well as small businesses including construction/reclamation, slashing, clearing, silviculture and the production and marketing of traditional crafts (Westcoast 2001, Beth Hrychuk, pers. comm.). The community Elders are employed as Traditional Land Use Advisors and monitor oil and gas, mining and forestry development through their active participation in archaeology and traditional land use assessments. Many members of the community participate in the traditional activities of hunting, trapping, fishing and the gathering of plants for food and medicines (Beth Hrychuk, pers.comm.).

McLeod Lake Indian Band

The McLeod Lake Indian Band (MLIB) is located along the shores of McLeod Lake, approximately 150 km north of Prince George along Highway 97. Over 200 McLeod Lake Indian Band community members reside on the reserve that is located along the Carp Lake Road. In March of 2000, the community signed an agreement with the Province of British Columbia and Canada to adhere to the terms of Treaty No. 8. According to the Dawson Creek LRMP (1999), the McLeod Lake Indian Band has traditionally used portions of the LRMP area, although specific reference to use of the Alberta Plateau RZM is not made. The McLeod Lake Indian Band has historically been involved in forestry enterprises but is actively pursuing opportunities for contracting in oil and gas development. Members of the community participate in the traditional activities of hunting, trapping, fishing and the gathering.

Saulteau First Nations

The Saulteau First Nations (SFN) is located at the eastern end of Moberly Lake on Highway 29. The reported on-reserve population increased from 160 in 1991, to 179 in 1996, to 325 people in 2000 (Westcoast 2001). Family-based businesses in the community include: traditional native crafts; guiding for hunters; a cross-cultural recreation camp; silviculture; horse logging; saw milling; ranching; falling, slashing and clearing for RoW and seismic lines; and lease and road construction (Westcoast 2001). SFN members are employed as Traditional Land Use Advisors and monitor oil and gas, mining and forestry development through their active participation in archaeology and traditional land use assessments. Traditional activities include hunting, trapping, fishing and gathering plants for food and medicine (Beth Hrychuk, pers. comm.).

Kelly Lake

Kelly Lake is located 120 km southeast of Dawson Creek near the Alberta border. The Kelly Lake community is comprised of two main groups. The Kelly Lake First Nations (KLFN) membership is comprised primarily of Cree, Saulteau and Beaver peoples, many of which are members of the Saulteau First Nations. Kelly Lake Cree Nation (KLCN) primarily represents the Metis/Cree aboriginal population at Kelly Lake (Beth Hrychuk, pers. comm.). Population at Kelly Lake was estimated at 140 in 1991 and 161 in 1996 (Westcoast 2001). In addition to traditional activities, some residents are seasonally employed in the oil and gas and forestry sectors (Westcoast 2001). KLFN and KLCN Elders are employed as Traditional Land Use Advisors and monitor oil and gas, mining and forestry development through their active participation in archaeology and traditional land use assessments. The Kelly Lake community uses a large portion of the Alberta Plateau Resource Management Zone for trapping, hunting fishing and berry-picking (Dawson Creek LRMP 1999).

Horse Lake First Nations

The Horse Lake First Nations (HLFN) has two reserves: the Horse Lakes Reserve located 60 km northwest of Grande Prairie, in the County of Grande Prairie No. 1; and the Clear Hills Reserve located 50 km northwest of Fairview. Most Horse Lake First Nations people living on reserve reside at the Horse Lakes Reserve. In 2000, the on-reserve population was estimated to be 289 people (Westcoast 2001a). The economy of the Horse Lake First Nations is based on agriculture, oil and gas and the forestry industries. The Horse Lake First Nations operates a mixed farm on reserve lands and earns some revenue from oil and gas leases on their land. These leases provide seasonal employment for some residents on the reserve. In addition to a couple of band-owned businesses, some Horse Lake people hunt and trap while others produce aboriginal arts and crafts for sale in the local market (Westcoast 2001a). HLFN members are employed as Traditional Land Use Advisors and monitor oil and gas, mining and forestry development through their active participation in archaeology and traditional land use assessments.

Aseniwuche Winewak Nation

The Aseniwuche Winewak Nation (AWN) was formalized in September 1994 by the joining of the six Aboriginal settlements surrounding the town of Grande Cache. The six settlements that comprise the AWN are Muskeg Seepee Cooperative, Susa Creek Cooperative, Kamisak Enterprise, Victor Lake Cooperative, Joachim Enterprise and Wanyandie Flats Cooperative. Aseniwuche Winewak is Cree for "Rocky Mountain People". The members of AWN are non-status Indians descended from Cree, Beaver, Stony and Iroquois; fur trappers; and traders who lived in the area. Most of the approximately 350 members live in the settlement areas. The settlements are located along Highway 40 within 40 km of the town of Grande Cache. In total the community has seven tracts of land totaling about 1,680 ha (4,150 acres).

While the traditional uses of the land by Dene and Cree peoples in the Project area are known in a general sense, the current use of lands for traditional purposes specific to the Project have been identified through the participation of Aboriginal representatives in the TUAS. Results of the TUAS and continued consultation with the Aboriginal communities has informed mitigation measures undertaken by Westcoast to protect traditional land uses and minimize Project-related effects to these activities and resources.

11.1.1.2 Archaeology and Traditional Land Use

A Preliminary Field Reconnaissance (PFR) of the proposed route was completed in early December 2000 to identify and assess any areas of potential archaeological potential. The PFR consisted of a low-level helicopter over-flight of the proposed route, a site file search of previously recorded archaeological sites on NTS map sheet 93-I-15, 93-I-10, 93-I-9 and 93-I-8, and a review of previous archaeology assessments in the Project area. While the entire pipeline route was reviewed, greater attention was paid to the major creek and river crossings and to areas in close proximity to known heritage resources sites.

As per the recommendations of the PFR, an Archaeological Impact Assessment (AIA) of the BC portion of the Project was conducted during the summer field season of 2001. The AIA was conducted under BC Heritage Inspection Permit 2001-196. Representatives of West Moberly First Nations, Kelly Lake First Nations, Kelly Lake Cree Nation and McLeod Lake First Nations assisted Landsong archaeologists with the assessment. Chiefs and Councils of each community selected participants for the study. The Saulteau First Nations declined several invitations to join the AIA team.

The AIA was conducted in concert with a Traditional Land Use (TUS) assessment. Together the two studies are referred to as the Traditional Land Use and Archaeology Assessment (TUAS). The AIA report and the B.C. TUS reports are separate documents with separate review protocols. The AIA report is submitted to the BC Archaeology Branch of the Ministry of Sustainable Resource Management and to Westcoast. Prior to submission of the AIA report to the BC Archaeology Branch and to Westcoast, the report is reviewed by each participating Aboriginal community to ensure that no sensitive traditional land use information has been inadvertently included in the report. No archaeology sites were identified in direct conflict with the proposed Project. The TUS report is also reviewed by the participating Aboriginal communities. Numerous TUS sites were recorded during the assessment, only a few of which would be directly affected by the route. Mitigation measures have been discussed with the communities. One potential effect has been mitigated by re-routing. Mitigation of other potential effects will include access management (through implementation of access controls and the Access Management Plan), flagging sites, and localized realignment. Sharing site-specific traditional use information with Westcoast and with the NEB will be at the discretion of these Aboriginal communities.

A Historical Resources Impact Assessment (HRIA) of the Alberta portion of the Project was conducted in part under Archaeological Research Permit 01-350 during the fall of 2001. Owing to inclement weather conditions, the HRIA was not completed in its entirety. The HRIA team, which consists of Landsong archaeologists and representatives of Horse Lake First Nations, has decided to postpone the completion of the HRIA and associated TUS until early in the 2002 season. Of importance is a previously recorded archaeological site located on the west-side of the Gunderson Creek. The directional drill stream crossing at this site will leave a broad undisturbed buffer zone on each side of the creek, and the site will not be disturbed. The site will be flagged and access around the buffer zone managed to ensure the site remains undisturbed during construction. This site will be further evaluated when the HRIA resumes in 2002 to confirm the extent of the area to be protected.

As with the BC assessments, the HRIA was conducted in concert with the Alberta TUS. The HRIA report is submitted to Alberta Community Development and to Westcoast. Prior to submission of the HRIA report to the Alberta government and to Westcoast, the report is reviewed by the Horse Lake First Nations to ensure that no sensitive traditional land use information has been inadvertently included in the report. The Alberta TUS report is also reviewed by the Horse Lake First Nation. Sharing site-specific traditional use information with Westcoast and with the NEB will be at the discretion of the Horse Lake First Nation.

The Aseniwuche Winewak Nation (AWN) is involved in a separate review process of the proposed Project with Westcoast. To date, Westcoast and Landsong have met with AWN to introduce the Project and provide maps. The AWN administration met with Elders that they considered have intimate knowledge of the Project area and reviewed the plans with them. The AWN and Landsong are currently planning a helicopter overflight with several AWN Elders to accommodate the Project review process. TUS information will be collected in accordance with the specification of the AWNs Traditional Land Use Sites Database.

11.1.2 Boundaries

11.1.2.1 Spatial Boundaries

The TUAS addresses past and current traditional land use and heritage resources in the vicinity of the Project and within the zone of influence of the Project. For archaeological resources, the spatial boundaries were for the most part be limited to the RoW, and areas directly adjacent.

11.1.2.2 Temporal Boundaries

The TUAS focuses on past and current traditional land use and heritage resources. Traditional land use sites recorded include sites of both past or present use. While TUS sites often date to the historic period, they are not limited to this temporal framework and may include sites that are also recorded as archaeological sites. In British Columbia, the AIA addresses sites that either pre-date 1846, or contain either the remains of plane crashes, ship wrecks or human remains regardless of antiquity (see the British Columbia Archaeological Impact Assessment Guidelines 1997). In Alberta, the HRIA includes both prehistoric and historic period sites (see the Guidelines for Archaeological Permit Holders in Alberta 1989).

11.1.3 Residual Environmental Effects Rating Criteria

A *significant residual environmental effect* on Aboriginal land use is any medium-term or longer Project-related or induced change in the current use of land and resources for traditional purposes by Aboriginal people or communities. The identification of significant residual effects and strategies to mitigate significant environmental effects are determined in conjunction with the Aboriginal communities using the Project area. A *significant residual environmental effect* would also arise from any Project-related disturbance to or destruction of an archaeological resource as regulated by the provinces of British Columbia or Alberta.

11.1.4 Evaluation of Project-related Environmental Effects

11.1.4.1 Potential Interactions

Table 11-1 provides an overview of the potential interactions of the Project with Aboriginal Land Use and Archaeological Resources. The principal environmental effects that could arise from the Project are the potential to interfere with the current use of lands and resources for traditional purposes and the potential for the loss of heritage and cultural resources. During all Project activities, there is potential for interference with the current use of lands and resources for traditional purposes. With aspects of the Project that involve ground disturbance, there is the potential for the loss of heritage and cultural resources.

Table 11-1
Potential Interaction of the Project with Aboriginal Land Use and Archaeological Resources

Project Activities and Physical Works	Potential Environmental Effects	
	Change in current use of land and resources for traditional purposes	Loss of heritage and cultural resources
Construction and Commissioning		
Access development	✔	✔
Right-of-way preparation	✔	✔
Mainline construction	✔	✔
Clean-up	✔	
Testing	✔	
Operation	✔	✔
Decommissioning and Abandonment	✔	✔
Accidents, Malfunctions and Unplanned Events		
Pipeline rupture/leak	✔	✔
Forest/bush fire	✔	✔
Spill or accidental release of hazardous materials	✔	✔
Loss of containment during water crossing(s)	✔	
Public access	✔	✔

11.1.4.2 Environmental Effects Analysis

11.1.4.2.1 Construction and Commissioning

Environmental effects on Aboriginal Land Use and Archaeological Resources that may occur as a result of construction and commissioning activities include a change in the current use of land and resources for traditional purposes and the potential loss of heritage or cultural resources (Table 11-2).

Conducting the TUAS allows for the identification of archaeological resources and Aboriginal traditional land use sites and resources. Potential effects on resources (both archaeological and traditional land use sites) will be eliminated or minimized through avoidance wherever possible or through the implementation of other mitigative strategies.

Westcoast will contract an archaeologist to be on-site during construction activities, particularly in areas of moderate to high potential for heritage resources. If an artifact or resource is uncovered during construction, procedures in the EPP and to be developed in the ERP will dictate that all work in the area will be halted, and the relevant provincial authorities and Aboriginal communities contacted for specific instructions on the removal and preservation of the find.

Based on the key to Table 11-2, potential residual adverse environmental effects on traditional land use will be of low magnitude, geographic extent, and duration throughout the construction phase of the Project. Construction activities that potentially cause residual adverse environmental effects will be frequent throughout this phase as it is the most labour intensive; however, most adverse environmental effects, except for the permanent loss of a cultural resource, are predicted to be reversible. Through cooperative work with the participating Aboriginal communities, and Westcoast's commitment to avoidance and mitigation of environmental effects, the residual environmental effects of construction and commissioning activities on Aboriginal Land Use and Archaeological Resources are rated as not significant.

Table 11-2
Environmental Effects Assessment Matrix: Aboriginal Land Use and Archaeological Resources - Construction and Commissioning

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Access Development	Change in current use of land and resources for traditional purposes	Traditional Use and Archaeology Study (TUAS), EPP, Caribou Protection Plan (CPP); Access Management Plan	1	3	1 / 4	R	2
	Loss of heritage and cultural resources	TUAS, EPP, route selection, ERP; Access Management Plan	1	3	1 / 2	I	2

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Right-of-way Preparation	Change in current use of land and resources for traditional purposes	TUAS, EPP	1	1	1 / 4	R	2
	Loss of heritage and cultural resources	TUAS, EPP, route selection, ERP	1	1	1 / 2	I	2
Mainline Construction	Change in current use of land and resources for traditional purposes	TUAS, EPP	1	1	1 / 4	R	2
	Loss of heritage and cultural resources	TUAS, EPP, route selection, ERP	1	1	1 / 2	I	2
Clean-up	Change in current use of land and resources for traditional purposes	TUAS, EPP	1	1	1 / 4	R	2
Testing	Change in current use of land and resources for traditional purposes	TUAS, EPP	1	1	1 / 4	R	2

KEY

Magnitude:

1 = Low: Short-term change in Aboriginal land use restricted to RoW or minor impairments of cultural resource appreciation.
2 = Medium: Medium-term change in Aboriginal land use may extend to the LSA or loss of historic or cultural resources not of major importance.
3 = High: Long-term change in Aboriginal land use may extend beyond the LSA or loss of historic or cultural resources of major importance.

Geographic Extent:

1 = Environmental effects restricted to RoW or extra workspace
2 = Environmental effects restricted to two km-wide LSA.
3 = Environmental effects extend beyond LSA

Duration:

1 = Short term: Environmental effects may occur for < 1 year.
2 = Medium term: Environmental effects may persist for the life of the Project.
3 = Long term: Environmental effects may persist beyond the life of the Project.

Frequency:

1 = Occurs once.
2 = Occurs rarely and at sporadic intervals.
3 = Occurs on a regular basis and at regular intervals.
4 = continuous

Reversibility:

R = Reversible
I = Irreversible

Socio-Cultural/ Ecological Context:

1 = Area is relatively pristine or not adversely affected by human activity.
2 = Evidence of adverse environmental effects

N/A = Not Applicable

TUAS = Traditional Use and Archaeology Study

ERP = Emergency Response Plan

11.1.4.2.2 Operation and Maintenance

Environmental effects on Aboriginal Land Use and Archaeological Resources during operation include only a change in the current use of land and resources for traditional purposes (Table 11-3).

Table 11-3
Environmental Effects Assessment Matrix: Aboriginal Land Use and Archaeological Resources – Operation and Maintenance

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	**Geographic Extent**	**Duration/ Frequency**	**Reversibility**	**Socio-Cultural / Ecological Context**
Operation and Maintenance	Change in current use of land and resources for traditional purposes	TUAS, EPP, CPP; Access Management Plan	1	2	1/2	R	2

KEY

Magnitude:
1 = Low: Short-term change in Aboriginal land use restricted to RoW or minor impairments of cultural resource appreciation.
2 = Medium: Medium-term change in Aboriginal land use may extend to the LSA or loss of historic or cultural resources not of major importance.
3 = High: Long-term change in Aboriginal land use may extend beyond the LSA or loss of historic or cultural resources of major importance.

Geographic Extent:
1 = Environmental effects restricted to RoW or extra workspace
2 = Environmental effects restricted to two km-wide LSA.
3 = Environmental effects extend beyond LSA

Duration:
1 = Short term: Environmental effects may occur for < 1 year.
2 = Medium term: Environmental effects may persist for the life of the Project.
3 = Long term: Environmental effects may persist beyond the life of the Project.

Frequency:
1 = Occurs once.
2 = Occurs rarely and at sporadic intervals.
3 = Occurs on a regular basis and at regular intervals.
4 = Continuous

Reversibility:
R = Reversible
I = Irreversible

Socio-Cultural/Ecological Context:
1 = Area is relatively pristine or not adversely affected by human activity.
2 = Evidence of adverse environmental effects (e.g., logging).

N/A = Not Applicable

TUAS = Traditional Use and Archaeology Study

Based on the key to Table 11-3, residual adverse environmental effects on traditional land use are predicted to be of low magnitude, geographic extent, duration, and frequency. Residual adverse environmental effects are also predicted to be reversible. The TUAS allows for the identification of areas of traditional use importance and of high potential for heritage resources, and thus to plan operation and maintenance activities so as not to adversely affect these. The residual environmental effects of operation and maintenance activities on Aboriginal Land Use and Archaeological Resources are rated not significant.

11.1.4.2.3 Decommissioning and Abandonment

Environmental effects on Aboriginal Land Use and Archaeological Resources that may occur as a result of decommissioning and abandonment activities include a change in the current use of land and resources for traditional purposes and the loss of heritage and cultural resources (Table 11-4).

Table 11-4
Environmental Effects Assessment Matrix: Aboriginal Land Use and Archaeological Resources - Decommissioning and Abandonment

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Decommissioning and Abandonment	Change in current use of land and resources for traditional purposes	TUAS, EPP, EPP: Access Management Plan	1	1	1/1	R	2
	Loss of heritage and cultural resources	TUAS, ERP, EPP: Access Management Plan	1	1	1/1	I	2

KEY

Magnitude:
1 = Low: Short-term change in Aboriginal land use restricted to RoW or minor impairments of cultural resource appreciation.
2 = Medium: Medium-term change in Aboriginal land use may extend to the LSA or loss of historic or cultural resources not of major importance.
3 = High: Long-term change in Aboriginal land use may extend beyond the LSA or loss of historic or cultural resources of major importance.

Geographic Extent:
1 = Environmental effects restricted to RoW or extra workspace
2 = Environmental effects restricted to two km-wide LSA.
3 = Environmental effects extend beyond LSA

Duration:
1 = Short term: Environmental effects may occur for < 1 year.
2 = Medium term: Environmental effects may persist for the life of the Project.
3 = Long term: Environmental effects may persist beyond the life of the Project.

Frequency:
1 = Occurs once.
2 = Occurs rarely and at sporadic intervals.
3 = Occurs on a regular basis and at regular intervals.
4 = continuous

Reversibility:
R = Reversible
I = Irreversible

Socio-Cultural/Ecological Context:
1 = Area is relatively pristine or not adversely affected by human activity.
2 = Evidence of adverse environmental effects (e.g., logging).

N/A = Not Applicable

TUAS = Traditional Use and Archaeology Study

ERP = Emergency Response Plan

The results of the TUAS allow Westcoast to plan decommissioning and abandonment activities so as to avoid areas of importance for traditional use and areas of high potential for heritage resources. Similar to the construction scenario, the EPP identifies procedures to be followed in the event that a heritage resource is uncovered during decommissioning and abandonment. The likelihood of disturbing potential heritage resource sites during decommissioning is low since ground disturbance will be limited – it is anticipated that much of the pipeline will be purged, capped, and prepared for in-ground containment. Based on the key to Table 11-4, residual adverse environmental effects on traditional land use during decommissioning and abandonment activities are expected to be of low magnitude, geographic extent, duration and frequency. Therefore, residual adverse environmental effects on traditional land use during decommissioning and abandonment are predicted to be not significant.

11.1.4.2.4 Accidents, Malfunctions and Unplanned Events

Environmental effects on Aboriginal land use and archaeological resources that could occur as a result of accidents, malfunctions and unplanned events include changes in current use of land and resources for traditional purposes and loss of heritage and cultural resources (Table 11-5).

Table 11-5
Environmental Effects Assessment Matrix: Aboriginal Land Use and Archaeological Resources - Accidents, Malfunctions, and Unplanned Events

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Pipeline rupture/leak	Change in current use of land and resources for traditional purposes	TUAS, ERP	1 - 2	1 - 2	1 / 1	R	2
	Loss of heritage and cultural resources	ERP	1 - 2	1 - 2	3 / 1	I	2
Forest/bush fire	Change in current use of land and resources for traditional purposes	TUAS, ERP	1 - 3	1 - 3	2 / 2	R	2
	Loss of heritage and cultural resources	ERP	1 – 3	1 – 3	3 / 2	I	2
Spill or accidental release of hazardous materials	Change in current use of land and resources for traditional purposes	TUAS, ERP	1	1	1 / 2	R	2
	Loss of heritage and cultural resources	ERP	1	1	3 / 2	I	2
Loss of containment during water crossing	Change in current use of land and resources for traditional purposes	TUAS, ERP	2	2	1 / 1	R	2
Public access	Change in current use of land and resources for traditional purposes	TUAS, ERP, AMP	1 – 3	1 – 3	3 / 3	R	2
	Loss of heritage and cultural resources	ERP, AMP	1	1	3 / 2	I	2

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
KEY Magnitude: 1 = Low: Short-term change in Aboriginal land use restricted to RoW or minor impairments of cultural resource appreciation. 2 = Medium: Medium-term change in Aboriginal land use may extend to the LSA or loss of historic or cultural resources not of major importance. 3 = High: Long-term change in Aboriginal land use may extend beyond the LSA or loss of historic or cultural resources of major importance.		Geographic Extent: 1 = Environmental effects restricted to RoW or extra workspace 2 = Environmental effects restricted to two km-wide LSA. 3 = Environmental effects extend beyond LSA Duration: 1 = Short term: Environmental effects may occur for < 1 year. 2 = Medium term: Environmental effects may persist for the life of the Project. 3 = Long term: Environmental effects may persist beyond the life of the Project.	Frequency: 1 = Occurs once. 2 = Occurs rarely and at sporadic intervals. 3 = Occurs on a regular basis and at regular intervals. 4 = continuous Reversibility: R = Reversible I = Irreversible		Socio-Cultural/Ecological Context: 1 = Area is relatively pristine or not adversely affected by human activity. 2 = Evidence of adverse environmental effects (e.g., logging). N/A = Not Applicable TUAS = Traditional Use and Archaeology Study ERP = Emergency Response Plan AMP = Access Management Plan		

The TUAS identifies areas of traditional use importance and areas of high potential for heritage resources. These areas will be targeted in the Westcoast ERP as areas of the highest concern. The EPP outlines procedures to follow and the relevant authorities to contact in the event that an accident, malfunction or unplanned event results in the loss of, or harm to, heritage and cultural resources.

Given that Westcoast, will finalize the construction ERP prior to the commencement of construction activities, the residual environmental effects of accidents, malfunctions, and accidents are rated not significant.

Successful access management is an important factor in mitigation of potential environmental effects of unplanned public access on traditional land use activities and heritage sites. Westcoast has developed a detailed Access Management Plan to address the concern of induced access on heritage and cultural resources as well as other VECs. Based on implementation of that Plan, the residual environmental effects of public access are rated not significant.

11.1.4.2.5 Summary

The TUAS allows for the identification and documentation of Aboriginal traditional land use resources and sites and the assessment of archaeological resources as per provincial regulations. Through continued consultation with Aboriginal communities within proximity to the Project and the cooperative efforts of all participants to share information necessary to undertake appropriate mitigation measures, Westcoast has undertaken to negotiate mitigation of potential Project-related effects on traditional land and resource uses and on archaeological sites to the satisfaction of all participants.

Given the characteristics of potential Project-related environmental effects on Aboriginal Land Use and Archaeological Resources and within the context of Westcoast's commitments to the TUAS, the environmental effects of the Project phases and the Project overall are rated not significant (Table 11-6).

Table 11-6
Summary of Project-related Environmental Effects, Aboriginal Land Use and Archaeological Resources

Phase	Residual Environmental Effects Rating
Construction and Commissioning	NS
Operation	NS
Decommissioning and Abandonment	NS
Accidents, Malfunctions and Unplanned Events	NS
Project Overall	NS

Key:
Residual environmental Effect Rating:
S = Significant Adverse Environmental Effect
NS = Not-significant Adverse Environmental Effect
P = Positive Environmental Effect

11.1.5 Cumulative Environmental Effects

The TUAS enables potential Project-related environmental effects to archaeological and heritage resources within the Project area to be identified and mitigated. In addition to pre-construction work, Westcoast will have a qualified archaeologist on-site during ground-disturbance or other activities where there is a potential to disturb unknown archaeological resources (*e.g.*, during clearing at creek crossings). As well, in any areas where the Project is in close proximity to known archaeological, heritage, or traditional resources, an archaeologist and an Aboriginal Traditional Land Use Advisor(s) will be on-site as required to ensure that sites are adequately protected. The Project-related environmental effects are, given the proposed mitigation, not significant. However, with the completion of the Project, an increase in oil and gas exploration and development in the Project area may contribute to cumulative environmental effects on traditional land use. As well, other projects and activities that increase access into previously undisturbed areas (*e.g.*, forestry and mining) may contribute to cumulative environmental effects on traditional land use, in combination with Project-related environmental effects. While Westcoast recognizes that Project-related environmental effects will be additive to cumulative environmental effects on the use of the land and resources for traditional purposes, the contribution of the Project-related environmental effects will not lead to significant adverse cumulative environmental effects. Westcoast is committed to the monitoring and management of cumulative environmental effects through the implementation of the Access Management Plan and ongoing discussions with Aboriginal communities as well as with the cooperation of other stakeholders and land users. The consideration and management of cumulative environmental effects on the landscape is the shared responsibility of all oil and gas proponents, forestry licensees, mining companies, Aboriginal communities, recreational users and government ministries operating within the Project area. Westcoast will participate in the West Central Caribou Standing Committee and other ongoing access planning processes (CAMP in BC), and will actively consult with other users in the area to coordinate access development and foster improved access management standards.

11.1.6 Monitoring and Follow-Up

As indicated Westcoast will have a qualified archaeologist on site during ground-disturbance or other activities where there is potential to disturb unknown resources (*e.g.*, during clearing). As well, in any areas where the Project is in close proximity to known resources, an archaeologist and an Aboriginal Traditional Use Advisor(s) will be on site to ensure that sites are adequately protected.

11.2 Additional Submissions

11.2.1 Westcoast

Aboriginal Communities

Westcoast identified the Lheidi T'enneh Nation (LTN) as another First Nation that may potentially be affected by the Project. Westcoast contacted the LTN as a result of a referral by the B.C. Ministry of Sustainable Resource Management -- Archaeological Branch. The Lheidi T'enneh Band is located in the Prince George area, southwest of the Project, and although the LTN considers the proposed development to be within their traditional territory that overlaps with that of other First Nations, they chose not to participate in either the archaeological or traditional land use sites assessments. However, the LTN did request copies of the study reports and Westcoast committed to forwarding these to the LTN.

Archaeology and Traditional Land Use Submissions

Westcoast submitted an Archaeological Impact Assessment (AIA) and a Traditional Land Use Site Assessment (TLUSA) for the B.C. portion of the Project. On the Alberta side of the proposed pipeline route, fieldwork has been completed and Westcoast has filed a preliminary submission and committed to filing the final reports subject to review by the involved First Nations. Discussion of the issues related to aboriginal land use and archeological resources for the Alberta portion of the Project is at the end of this section.

The TLUSA report noted that the terms archaeology site and traditional land use (TLU) site should not be used interchangeably. The definition of a TLU site does not require the presence of artifacts and/or archaeological features and TLU sites may document animal habitations, or vegetation in contrast to archaeology sites, which require evidence of human occupation.

Archaeological Assessment

Westcoast's initial search of previously recorded archaeological sites in B.C. identified twenty-one archaeological sites, one historic structure and one memorial site located within close proximity to but not in direct conflict with, or directly adjacent to, the Project. During the field reconnaissance portion of the AIA, no archaeological sites were identified as being in direct conflict with the Project in B.C. However, due to changes made to the proposed pipeline route after the 2001 field season, additional archaeological investigation was recommended for the 2002 field season. This would identify and test areas of moderate and high archaeological potential between KP 35.7 and KP 46.1 and between KP 72.4 and KP 76.0 of the final route.

Westcoast submitted that through the participation of First Nations and Metis Elders, field assessments have been carried out in a manner that is sensitive to the aboriginal requirements for archaeological work, as well as meeting the guidelines stipulated by the Province of B.C.

Traditional Use Assessment

Westcoast submitted that the primary objective of the TLU sites assessment was to inventory and map site-specific traditional land uses directly associated with the Project. The TLUSA report noted that TLU site information and associated traditional ecological knowledge (TEK) are considered proprietary to the participating aboriginal communities. In order to balance those proprietary interests with the need to share information for Westcoast to mitigate any potential impacts, information sharing protocols were established and two TLU reports were produced, a Basic Report and a Detailed Report. Both reports were reviewed by all four participating communities prior to the release of the Basic Report.

The Detailed Report was prepared specifically for the First Nations participating in the assessment and is envisaged as being for their use in resource planning, community-based education and for in-house discussions with Westcoast and other stakeholders in the Grizzly area.

The Basic Report contains brief descriptions of the nine types of TLU sites found in the area, as well as spatial data to facilitate site mitigation, and the mitigation measures for each site.

The nine types of TLU sites are:

- culturally modified trees (CMTs) and pack trails;
- game trails and animal habitat sites;
- traps and snares;
- campsites;
- historic structure sites;
- medicinal plant sites;
- plants for food and berry picking sites;
- human birth places and burials; and
- sacred and ceremonial sites.

After identifying a TLU site, the TLU team considered the site's significance within a context of TEK and aboriginal history, considered the potential planned and unplanned project related impacts, and recommended appropriate impact mitigation options. Sites of low significance are usually documented for inventory purposes. Sites of moderate significance are usually responded to with options for minimizing impact or avoidance. Sites considered to be of high significance usually require avoidance.

The Basic Report also summarized the mitigation measures proposed for each of the forty-eight TLU sites recorded. The mitigation measures include:

- avoidance (2 sites);
- no additional work space (12 sites);
- agreements regarding chemical applications (5 sites);
- strict adherence to the proposed ROW (13 sites);
- access control measures (1 site); and
- TLU monitoring (30 sites).

Fifteen sites were deemed to not require any mitigation measures. The proposed mitigation recommendations for most of the sites have been accepted by Westcoast, with the exception of one (TLU site #17). Westcoast has committed to resolving this matter with the TLU team.

In order to maintain a high level of certainty regarding TLU sites mitigation strategies, Westcoast has agreed, in principle, to a TLU monitoring program. This would be developed by the participating aboriginal communities and Westcoast and would be conducted during selected phases of the proposed pipeline construction and reclamation.

Due to changes to the proposed pipeline route after the 2001 field season, about 17 km of revised routing still needs to be assessed prior to construction of the proposed pipeline. This includes the sections, KP 33.5 to KP 39.6, KP 40.0 to KP 46.0, KP 65.0 to KP 67.7, and KP 73.0 to KP 76.0.

A second objective of the TLUSA was to consider traditional land use and specific sites within the broader context of the greater cultural landscape that includes the dynamic interactions between land, water, air and all living things. The TLUSA reported that participating Elders frequently returned to the issues of increased development within the Project area, more wellsites, more pipelines, increased traffic on the roads, more hunters, and more recreational users on ATVs and skidoos. Concern was also raised by the Elders about the general impact to animal habitat along the proposed route and in the greater Wapiti area. In considering plant harvesting sites, the TLUSA also noted that the ubiquitous nature of such sites requires their consideration as part of the cultural landscape rather than at a site-specific level.

The TLUSA report acknowledged that it is the implementation of a comprehensive access management plan, air and water quality control, environmental measures regarding fur bearers, ungulates, fish, and rare plants among others, and a vision of potential cumulative impacts relating to the proposed pipeline development that will ultimately determine the future of the cultural landscape. Westcoast also stated that its access management plan would serve to protect traditional use areas by deterring and limiting access to the right of way, and that the company would continue to incorporate traditional use information into project planning and design. Furthermore, the maintenance of a healthy cultural landscape may contribute to the maintenance of Treaty and Aboriginal rights.

Westcoast also elaborated on linkages between the assessment of traditional use and other VECs, in particular between Project environmental effects on vegetation and on traditional use of plants, and between project environmental effects on caribou and on traditional use of wildlife, in particular the hunting of other ungulate species. Westcoast submitted that the vegetation assessment of the CSR examined valued plants and plant communities, of limited abundance in the Project area and which could be affected. It noted that the measures prescribed to preserve valued elements of the vegetation VEC, as found in Chapter 8 of the CSR, would also act to preserve these elements for traditional use. With respect to the hunting of moose, elk and deer for traditional use, Westcoast noted that caribou are more sensitive to the clearing of forested land and the reduction of core security habitat. Thus the analysis of changes in core habitat security and road density for caribou can be considered a more conservative assessment of risk for other ungulates. Westcoast further added that the proposed access control measures to protect caribou would also reduce mortality risk for other ungulates; that moose, elk and deer tend to benefit from the conversion of older forest communities into early succession ones; that the reclaimed right of way would represent a forage source close to cover; and that moose, elk and deer have a higher reproductive potential than caribou.

Alberta Portion

Fieldwork with the Horse Lake First Nation (HLFN) and the Aseniwuche Winewak Nation (AWN) of Canada has been completed for the archaeological and traditional land use assessments for the Alberta portion of the Project. Westcoast stated that it is in the final stages of completing the formal reports with the participating First Nations. The AWN did not identify any specific sites in the Project area. The HLFN identified potential project effects on two sites at the Gunderson Creek crossing and on a site near the Goat Creek crossing. These are the only locations along the Alberta portion of the proposed route identified for mitigation. In all cases Westcoast has agreed to carry out minor route changes to mitigate the potential effects. Westcoast submitted that subject to final review of the report by the participating First Nations, no other issues have been identified with respect to the Alberta portion of the proposed pipeline.

11.2.2 Department of Fisheries and Oceans Canada (new section)

DFO stated in its 16 September 2002 letter[10] that it has discussed the issue of traditional land use site #17 with Westcoast and understands that minor route changes would be made to minimize any impacts to site #17, and that this was done to the satisfaction of involved First Nations.

DFO observed that the background information has been collected for the Alberta portion of the Project and only two sites were identified. Given this, together with the commitments made by Westcoast, it is reasonable to assume that the mitigation would be effective.[10]

11.3 Conclusions and Recommendations

Westcoast's differentiation between archaeology and TLU sites assessment is appropriate. Moreover, it is noted that, not only do these sites have different characteristics, but as environmental components to be assessed (under CEAA) they also have other important distinctions. Archaeological or historical field studies are generally subject to provincial legislation which often (as is the case in B.C. and Alberta) require a permit and an impact assessment. In contrast, there are no regulations that set out reporting requirements for the assessment of impacts on the current use of lands and resources for traditional purposes by Aboriginal persons. In terms of assessment, unlike archaeological sites, the potential effects of a project on traditional land and resource use are not necessarily limited to site-specific impacts. Consequently the assessment should also consider any relevant non-site-specific impacts. The submission of distinct archaeological and TLU assessment reports for the B.C. portion of the proposed route provided both the required elaboration to the revised draft CSR, and differentiation between the elements to be assessed.

While the First Nations have concerns regarding the confidentiality of traditional use information, especially site-specific information, the responsible authorities have a legislated obligation to review and assess any potential effects of project-related environmental impacts on the current use of lands and resources for traditional purposes by Aboriginal persons. In this case, Westcoast and the participating

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[10] Comments provided pursuant to paragraph 16 of Amended Hearing Order and Directions on Procedure AO-02-GH-2-2002

First Nations have struck a balance that respects and maintains the confidentiality of information for First Nations participants, and provides sufficient information to give responsible authorities confidence in the assessment conducted. The information and results presented in the TLUSA Basic Report provide a good information base with which to review and assess the likelihood and potential significance of project-related impacts.

With respect to the concerns expressed by Elders that impacts on current traditional Aboriginal land and resource use are not restricted to specific sites, it is noted that the assessment of all aspects of the project, including cumulative effects, complements and addresses these concerns for consideration of the greater (cultural) landscape.

With regard to specific archaeological sites, it is noted that none were identified for the B.C. portion of the Project and that Westcoast has measures in place in the event of an unexpected find.

With regard to specific traditional land uses sites, it is noted that mitigation measures have been agreed on by Westcoast and all parties to the TLUSA for the B.C. portion of the Project, except for one site. While Westcoast is committed to resolving this matter, in order to ensure that it is given the necessary attention and priority, it is recommended that:

> ***Recommendation 3:***
>
> Westcoast shall file with the Board, at least 14 days prior to the commencement of construction or as otherwise directed by the Board, with respect to the traditional land use site found at UTM location 0663386E 6067418N (site #17 in Landsong, February 2002, Traditional Land Use Sites Assessment Basic Report):
>
> (a) a description of the measures to be implemented for the mitigation of potential impacts to the site; and
>
> (b) the results of the consultations with the Kelly Lake First Nations, Kelly Lake Cree Nation, West Moberly First Nations and McLeod Lake Indian Band.

For both the archaeological and traditional land uses assessments, there are portions of the proposed pipeline route in B.C. that were revised subsequent to the 2001 field season. While Westcoast has committed to completing the necessary corresponding revisions to the assessments for those route revisions, the following recommendation will ensure that a review of these revisions is undertaken:

> ***Recommendation 4:***
>
> Westcoast shall file with the Board, at least 14 days prior to the commencement of construction, any revisions to the Traditional Land Use Sites Assessment and Archaeological Impact Assessment for the British Columbia portions of the Project.

With regard to the Alberta portion of the Project, it is noted that the field assessments have been completed, that only two sites were identified, and that Westcoast has agreed to minor route changes to mitigate potential impacts to those two sites. While Westcoast has committed to submitting the final archaeological and traditional land use assessment reports, it is recommended that:

Recommendation 5:

Westcoast shall file with the Board for approval, at least 60 days prior to the commencement of construction or as otherwise directed by the Board:

(a) a Traditional Land Use Sites Assessment report for the Alberta portion of the Project;

(b) a Heritage Resources Impact Assessment report for the Alberta portion of the Project; and

(c) copies of correspondence from the British Columbia and Alberta provincial authorities responsible for Archaeological and Heritage Resources, regarding the acceptability of Westcoast's impact assessment reports and proposed mitigation measures.

With these recommendations and the commitments already made by Westcoast, the effects of the environmental changes caused by the Project on archaeological and heritage resources, and on the current use of land and resources for traditional purposes by Aboriginal persons are not likely to be significant.

Chapter 12

Community Services and Infrastructure

12.1 Westcoast Submission - Revised Draft CSR - 4 January 2002

12.1.1 Existing Conditions

12.1.1.1 Temporary Accommodation and Food Services

Temporary accommodation in northeastern BC and northwestern Alberta consists of hotels, motels, bed and breakfasts and provincial and private campgrounds/recreation vehicle (RV) parks. In northeastern BC, in and around Fort St. John, Dawson Creek, Tumbler Ridge, and Chetwynd, there are 42 hotels and motels with approximately 1,345 rooms as well as 30 campgrounds/RV parks with about 935 sites. All smaller communities in northeastern BC have restaurants and grocery stores but the larger communities of Fort St. John and Dawson Creek offer a greater number and variety of food services than the smaller communities. There are no facilities in the immediate vicinity of the proposed pipeline route (Westcoast 2001a).

In Alberta, Grande Prairie and surrounding areas also offer temporary accommodation at hotels, motels, provincial and private campgrounds. In Grande Prairie there are 12 hotels and motels with the capacity to accommodate 1,250 guests. Eleven campgrounds with a total of 580 RV/campsites are located in the Grande Prairie area. The City of Grande Prairie offers a range of restaurants and large and small groceries stores typical of an urban centre. Smaller surrounding communities offer a more limited range of restaurant and food services (Westcoast 2001a). Similarly, there are no facilities in the immediate vicinity of the proposed pipeline route in Alberta.

12.1.1.2 Existing Construction Camp Facilities

Currently, there are two existing "open" construction camps in the vicinity of the Project and one proposed "open" camp. An "open" camp is one that operates like a motel and is not dedicated to a single contractor or project. One open camp is located in the Town of Tumbler Ridge, and the other is located in Alberta, on the Two Lakes Road west of Grande Prairie, and one is proposed for a location in British Columbia, near the Red Deer River airstrip. The camp in Tumbler Ridge will be utilized by construction, inspection, and other field staff in Phase 1 of Project construction scheduled for July – October, 2002.

The open camp in Alberta is located at KP 114 on the Two Lakes Road, southwest of Grande Prairie. This camp, which has been operating for 1.5 years, can accommodate 125 people. The camp owner has also optioned adjacent Crown land should additional camp capacity be required. The open camp on the Two Lakes Road will be used to accommodate construction personnel during Phase 2 of construction (*i.e.*, fall 2002 – spring break-up 2003).

At the open camp on Two Lakes Road, the water supply is obtained from a groundwater well. Sewage and grey water are handled and disposed of with an on-site sewage treatment plant and small lagoon. Garbage produced at the camp is incinerated daily on-site. The ashes are stored in bear-proof bins until transported to the landfill at Grande Prairie. The camp is not fenced and to date there have been no incidents of wildlife entering the camp.

Applications are currently under review for the proposed open camp to be situated near the Red Deer River airstrip in British Columbia. A Fort St. John-based business plans to develop a 100-150 person open camp at this location. In this area, the camp could serve the drilling, seismic, pipeline, and road construction crews as well as the forest industry. If the camp is operational by July 2002, the Grizzly Extension Pipeline contractor will utilize it for both phases of the proposed construction schedule (*i.e.*, July – October 2002 and fall 2002 – spring break-up 2003).

It is assumed that the water, sewage treatment, and waste handling for the proposed open camp near the Red Deer River airstrip will be similar to the existing camp on the Two Lakes Road.

If the proposed open camp near the Red Deer River airstrip does not receive approval and is not constructed, the construction contractor will make the necessary arrangements and obtain the necessary permits to construct a temporary camp near the same location to accommodate approximately 200 people. The water, sewage treatment and waste handling for the temporary construction camp would be designed and constructed in accordance with permit requirements and due consideration for preventing wildlife conflicts.

12.1.1.3 Medical, Health and Ambulance Services

In the BC region of the proposed pipeline, medical and health services fall within Local Heath Area No. 59 and No. 60. The three hospitals serving this area are located in Fort St. John, Dawson Creek, and Chetwynd. Tumbler Ridge has a full service medical clinic and is closest to the proposed route in BC. In addition, Fort St. John, Dawson Creek, Chetwynd, and Tumbler Ridge have ambulance service and a full range of other health services such as dental care and individual and group counseling. Smaller communities depend upon the medical and health services provided in these three urban centres (Westcoast 2001a).

Two hospitals serving the northwestern portion of Alberta, in the vicinity of the proposed pipeline are located in Grande Prairie and Beaverlodge. Grande Prairie also offers a full range of other health services, including medical and dental clinics (Westcoast 2001a).

12.1.1.4 Police, Fire, and Emergency Response

Law enforcement, crime prevention and highway patrols for the BC region of the proposed Project are provided by RCMP detachments in Fort St. John, Dawson Creek, Chetwynd, and Tumbler Ridge. Smaller communities and rural residents rely upon the nearest RCMP detachment for coverage (Westcoast 2001a).

Fire protection in most areas in northeastern BC is provided by volunteer fire departments. Fort St. John and Dawson Creek have the only permanent full-time fire departments in the area. Chetwynd and

Tumbler Ridge have full-time fire chiefs. Fire protection coverage in smaller towns and rural areas is provided by agreement with fire departments located in nearby communities (Westcoast 2001a).

Emergency response services include the Provincial Emergency Program (BC) (coordinated by local fire chiefs) and individual industry emergency evacuation programs.

Two local RCMP detachments located in Grande Prairie and Beaverlodge serve the surrounding area in northwestern Alberta. In addition, the County of Grande Prairie employs five special constables to enforce provincial regulations and by-laws in outlying areas (Westcoast 2001a).

Fire protection in most communities around Grande Prairie is provided by volunteer fire departments. Grande Prairie has the only permanent full-time fire department in the Alberta portion of the Project area and offers a 911 service. It also provides fire suppression services to the County within a 365 square mile area surrounding Grande Prairie. Ambulance service is also available throughout the County. In addition, the Northern Life Flight Program provides rapid evacuation of patients in need of specialized care (Westcoast 2001a).

The Grande Prairie Fire Department coordinates disaster planning and preparation for major emergencies. Medical aerial response services include a team of physicians, paramedics, pilots, and ground crew (Westcoast 2001a).

12.1.1.5 Roads

Map 1 (provided in pouch, Section 2.0) identifies provincial and resource roads in the vicinity of the proposed pipeline route in both BC and Alberta. It should be noted that existing access to the proposed route is extensive and that very little additional access will be necessary to construct, maintain, or decommission the pipeline.

In northeastern BC, Highway 97 provides the main north/south corridor through the region for local, commercial, and tourist traffic. From Dawson Creek north, Highway 97 is known as the Alaska Highway. West of Dawson Creek Highway 97 passes through Chetwynd and provides road access to Prince George and Vancouver. Highway 43 runs southeast from Dawson Creek into Alberta, providing access to Grande Prairie and east and south to Edmonton, through Valleyview and Whitecourt. Highway 29 provides another north/south road link in the area that connects Tumbler Ridge, Chetwynd and Hudson Hope to Highway 97 near Fort St. John. The Heritage Highway (Highway 52) provides direct access between Tumbler Ridge and Dawson Creek. Other roads, including forestry roads, petroleum development roads (PDRs) and Crown roads are found throughout northeastern BC. There are over 1,700 km of forestry roads in the northeastern region of BC, in the vicinity of the proposed pipeline that provide access to timber, recreation, grazing, and forest protection from fire, insects and disease. There are hundreds of kilometres of PDRs built and maintained by oil and gas companies to provide access to natural gas exploration, production, and pipelines in the northeast area. Local industries as well as the general public use the roads found throughout northeastern BC (Westcoast 2001a).

In northwestern Alberta, Highway 34 and 43 provide access to Edmonton and southern Alberta from Grande Prairie while Highway 2 provides access west to Dawson Creek and north to Peace River. Highway 40 runs south from Grande Prairie and connects with the Yellowhead Highway (Highway 16) near the east entrance to Jasper National Park. A number of secondary highways and roads provide linkages to and between other communities within the County of Grande Prairie. In addition, there is over 300 km of resource roads within publicly held lands within the County that are the responsibility of forestry and oil and gas operators. In the MD of Greenview, there are also hundreds of kilometres of resource roads maintained by forestry and oil and gas operators (Westcoast 2001a).

Westcoast will use the existing provincial and inter-provincial roads and resource roads that access the proposed pipeline route on a continuous basis during construction and commissioning to transport personnel and materials to the construction sites. It is anticipated that Tumbler Ridge will be the hub of construction-related activity for the BC section of the proposed Project and Grande Prairie, for the Alberta section, as they are the closest communities to the proposed route. Access to the pipeline RoW is provided via the Wapiti Forest Service Road off of the Heritage Highway in British Columbia or via logging roads off Two Lakes Road in Alberta. The pipeline route has a network of existing RoWs that are amenable to use by various types of vehicles. These RoWs include seismic lines and other cutlines. The Project will require temporary construction access along the RoW between the Huguenot Road and the Two Lakes Road crossing. Improvements to existing access will be required primarily along the Huguenot Road (KP 52 to 70) and the Lyon Road. The improved access will involve some grading and replacement of culverts to make the route accessible by construction machinery. Shoo flies will be used for some stream crossings but will be reclaimed following construction. Refer to Section 2.1.6.1 for further details.

12.1.1.6 Commercial Trucking and Bus Service

Northeastern BC and northwestern Alberta are well serviced by local, provincial, and inter-provincial trucking operations. Dawson Creek is a transportation hub for northeastern BC and a distribution centre for the area, and Chetwynd is a depot for two inter-provincial carriers. Grande Prairie hosts a number of charter bus companies and several regional and national courier companies serve the area (Westcoast 2001a).

Greyhound Canada provides daily passenger bus service to Fort St. John, Dawson Creek, and Chetwynd from other parts of BC and Alberta. Dawson Creek is the main hub for passenger bus routes north, south, east, and west. A daily freight service is available from Tumbler Ridge to Dawson Creek and a private bus charter service is available in Chetwynd (Westcoast 2001a).

12.1.1.7 Railway Infrastructure

CN Rail and BC Rail provide rail service to and within northeastern BC. A CN Rail branch line runs eastward from Dawson Creek and provides a linkage to the main CN Rail transcontinental line. BC Rail provides a north/south rail link from Vancouver to Chetwynd, Dawson Creek, and Fort St. John. In addition, it provides an electric branch line between Prince George and Tumbler Ridge to service the Northeast Coal Project. Unit trains transported coal from the Quintette (shut down in August 2000) and Bullmoose coal mines (still operational) near Tumbler Ridge to Prince George and onward on BC Rail's main line to port facilities in Prince Rupert (Westcoast 2001a).

CN Rail and Alberta Resources Railway provide rail service to the northwestern region of Alberta. A branch line of the CN Rail links Grande Prairie and the County of Grande Prairie with the CN main line in Edmonton. The Alberta Resources Railway operates a rail line between Hinton and Grande Prairie along Highway 40 (Westcoast 2001a).

12.1.1.8 Airports

In northeastern BC, Fort St. John, Dawson Creek, Chetwynd, and Tumbler Ridge have airports with paved airstrips but only the Fort St. John and Dawson Creek airports have daily commercial airline passenger and freight service to other locations in BC and Alberta. All noted airports in northeastern BC accommodate helicopter charters, small fixed wing charter aircraft, and private planes that transport passengers and small freight in and out of the area (Westcoast 2001a).

The Grande Prairie Regional Airport offers daily passenger and freight service to various locations in Alberta and BC. The airport can accommodate private fixed wing aircraft as well as small corporate jets. It is also the base of operations for charter fixed wing aircraft and helicopters. As well, there is an airstrip that parallels the Red Deer Creek in BC, near the proposed pipeline route at KP 36.1 (Westcoast 2001a).

12.1.1.9 Regional Landfills

The Peace River Regional District (PRRD) operates waste transfer stations at various locations in the BC portion of the proposed route, as well as regional landfill sites at Chetwynd, Dawson Creek and Bessborough. The transfer stations and regional landfills accept regular household garbage, municipal waste, and industrial waste, provided that they do not include special waste as defined under the BC *Waste Management Act*. In addition, Dawson Creek and Chetwynd have paper, cardboard, and plastic recycling programs (Westcoast 2001a).

The City of Grande Prairie provides residential waste collection on a weekly basis and transportation to the City's landfill site located south of the community. Industrial and commercial solid waste collection is contracted privately. This waste is accepted at the City's landfill provided it does not contain any hazardous wastes. The City has a Waste Diversion Program, designed to encourage private sector recycling and to reduce the amount of waste going into the landfill (Westcoast 2001a).

12.1.2 Boundaries

12.1.2.1 Spatial

Spatial boundaries for the consideration of potential environmental effects on community services and infrastructure include the towns of Tumbler Ridge, Chetwynd, Dawson Creek, Fort St. John, the City of Grande Prairie, the County of Grande Prairie No. 1, the MD of Greenview, as well as the West Moberly (BC), Saulteau (BC), Horse Lake (Alberta), and Aseniwuche Winewak (Alberta) Aboriginal communities and surrounding rural communities.

12.1.2.2 Temporal

Environmental effects of Project-related activities on community services and infrastructure can occur during construction and commissioning, operation and maintenance, and decommissioning and abandonment. As well, environmental effects can occur as a result of malfunctions, accidents, and unplanned events.

Construction and commissioning of the proposed pipeline are anticipated to occur during two periods commencing in July 2002 (finishing in October 2002) and fall 2002 (finishing prior to spring break-up 2003). The life of the Project is anticipated to be 40 years and the presence of the cleared RoW is considered to be permanent throughout that time. Decommissioning and abandonment has been considered as a possible future event and the duration of activities will be similar to the construction phase. Malfunctions, accidents and unplanned events can occur at any time during the construction, operation, or decommissioning and abandonment phases of the Project.

12.1.3 Residual Environmental Effects Rating Criteria

The development of residual environmental effects rating criteria for community services and infrastructure required the consideration of a number of factors, including:

- the proposed Project is compatible with existing land use plans and objectives in BC and in Alberta; and
- the construction phase of the Project, where the most stress on nearby community services and infrastructure will occur, will be low in intensity and short in duration.

The definition for the rating of residual environmental effects, including cumulative environmental effects, on community services and infrastructure is:

A *significant residual environmental effect* is one that results in a decline in the quality of community services and/or the integrity of community infrastructure that will extend beyond the life of the Project, or that will persist for more than one year in the region or provincially.

A *not significant residual environmental effect* is one that results in a decline in the quality of community services and/or the integrity of community infrastructure in nearby communities for a period of less than one year and that does not preclude the use of the infrastructure or community services by residents of the nearby communities during the construction phase when the most stress will be placed on community services and infrastructure.

12.1.4 Evaluation of Project-related Environmental Effects

12.1.4.1 Potential Interactions

Potential interactions between Project-related activities and Community Services and Infrastructure are identified in Table 12-1.

Table 12-1
Potential Interaction of the Project with Community Services and Infrastructure

Project Activities and Physical Works	Potential Environmental Effects	
	Change in the quality or use of infrastructure	Change in the quality of community services
Construction and Commissioning		
Access development	✓	
Accommodation	✓	✓
Transportation of materials, personnel, and equipment	✓	
Operation and Maintenance		
Inspection	✓	
Decommission and Abandonment	✓	✓
Accidents, Malfunctions and Unplanned Events		
Pipeline rupture/leak	✓	✓
Construction worker accidents	✓	✓
Public accidents	✓	✓
Vehicle collisions	✓	✓
Forest/bush fire	✓	✓
Spill or accidental release of hazardous materials	✓	✓
Public access	✓	

Potential environmental effects will primarily occur during construction and commissioning, and potentially as a result of accidents, malfunctions, and unplanned events. As well, environmental effects may occur as a result of some operations/maintenance and decommissioning and abandonment activities. As described in Table 5-3, a change in the quality or use of infrastructure refers to the potential effects on transportation infrastructure or motor vehicle safety as a result of Project-related activities. A change in the quality of community services refers to the potential stresses placed on accommodation, food services, medical, police, fire, and emergency services as a result of Project-related activities.

Construction of the pipeline will proceed rapidly over two periods as noted in Section 12.1.2.2, commencing in July 2002 and fall 2002. The construction phase will see the greatest level of activity in nearby service centres and transportation nodes. Some personnel will be housed at the camp; in Tumbler Ridge with associated effects on accommodation and food services. Transportation from camps to the work site will be by crew buses on existing provincial, municipal, and resource roads. Inspection and maintenance during operation typically would involve very few people or demands on community services and infrastructure. Maintenance activities which may involve somewhat larger crews would be infrequent and of short duration. Accidents, malfunctions, and unplanned events are unlikely, but if they occur, are most likely to be localized and short term in duration. Procedures to deal with construction accidents, malfunctions, and unplanned events will be provided in the on-site Emergency Response Plan (Section 2.1.9.4). There will be trained personnel, equipment and vehicles at the pipeline work sites to provide emergency medical treatment and transportation to the nearest doctor and medical facility. The Project is not expected to noticeably affect the medical personnel and facilities or cause delays or disruptions to the level of medical service presently available to area residents.

Analysis and discussion of mitigation measures for all Project-related environmental effects are addressed in the following sections.

12.1.4.2 Environmental Effects Analysis

12.1.4.2.1 Construction and Commissioning

Environmental effects on Community Services and Infrastructure that may occur as a result of construction and commissioning activities include changes in the quality or use of existing infrastructure and changes in the quality of community services (Table 12-2). Currently the level of community services is adequate, reflecting the needs of the communities, to support the construction phase of the Project.

Table 12-2

Environmental Effects Assessment Matrix: Community Services and Infrastructure – Construction and Commissioning

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Access development	Change in the Quality or Use of Infrastructure (A)	Existing access roads will be used to minimize construction of new access roads; existing local access roads will be upgraded as required to safely accommodate construction vehicles; speed limits will be observed and enforced	1	1	2/1	R	2
Transportation of materials, personnel, and equipment	Change in the Quality or Use of Infrastructure (A)	Minimize vehicle trips by carpooling and/or transporting personnel by bus; temporary access will be removed during reclamation; access controls will be put in place; speed limits will be observed and enforced	1	1	2/4	R	2
Personnel Accommodation	Change in the Quality of Community Services (A)	Construction camps will be available	1	1	2/4	R	2

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
KEY Magnitude: 1 = community services and infrastructure are affected in nearby communities for less than one year 2 = community services and infrastructure are affected in nearby communities for more than one year, but less than the predicted life of the Project 3 = community services and infrastructure in nearby communities are affected for longer than the predicted life of the Project, or irreversibly		Geographic Extent: 1 = nearby communities 2 = regional (northeastern BC and/or northwestern Alberta) 3 = BC and/or Alberta Duration: 1 = < 1 month 2 = >1 month but <1 year 3 = >1 year	Frequency: 1 = < 10 events/year 2 = 11-50 events/year 3 = 50-100 events/year 4 = continuous Reversibility: R = Reversible I = Irreversible		Socio-Cultural/Ecological Context: 1 = Area has not been adversely affected by human activity. 2 = Evidence of adverse environmental effects N/A = Not Applicable		

Access and Transportation Infrastructure

During construction, construction-related traffic will be associated with the transportation of heavy equipment and with the transportation of workers to and from the site. Provincial highways, municipal roads, and Forest Service Roads will be used during construction to transport equipment and workers to and from the Project site.

Concerns that were raised with respect to construction and commissioning activities included the additional stress on the existing road system from construction vehicles and motor vehicle safety. Currently, the existing road infrastructure meets the needs of current Projects and activities. Some local roads in British Columbia will require minor upgrading to accommodate construction traffic. Minor road upgrading and maintenance activities are the responsibility of the local municipal authority and the Provincial government. Minor upgrades to existing roads to accommodate construction traffic may include activities such as re-paving or filling in potholes. Road use agreements will be signed with the MD of Greenview No. 16 forest services and private road tenure holders in the Project area in both provinces. These will include provisions for any upgrades of local roads required for construction use. Refer to Section 2.1.6.1 for further details.

Westcoast will use existing access roads and provincial roads where possible to minimize the need to construct new access roads. However, some new temporary access roads to the RoW will be necessary. Any temporary access that is created during construction will be removed during reclamation, and other access controls on remaining access roads will be implemented to discourage use. Speed limits on all access roads and provincial roads will be strictly observed and enforced. Westcoast will minimize the number of vehicles traveling on roads by carpooling and/or transporting personnel by bus to and from construction sites.

Personnel Accommodation

As noted in Section 12.1.1.2, there are three construction camps that could be used to accommodate the pipeline construction crews. During Phase 1 (July – October 2002) construction crews will be accommodated at an existing camp in Tumbler Ridge and a camp in the vicinity of the Red Deer Airstrip (either a proposed open camp, or a temporary construction camp to be set up by the construction contractor). The workforce to be housed at each camp is projected to be 175-200. During Phase 2 (fall 2002 – spring break-up 2003), similar sized construction crews will be housed at the existing camp in Alberta on the Two Lakes Road and again, at the Red Deer Airstrip area camp.

The camp in Tumbler Ridge uses existing infrastructure in the Town of Tumbler Ridge.

As noted in Section 12.1.1.2, the Alberta camp has self-contained infrastructure: the water supply is obtained from a groundwater well; and sewage and grey water are handled and disposed of with an on-site sewage treatment plant and a small lagoon. The Alberta camp owner has optioned adjacent Crown land and would be able to expand camp capacity should that be required.

Garbage produced at the Alberta camp is incinerated daily on-site. The ashes are stored in bear-proof bins until transported to the landfill at Grande Prairie. The camp is not fenced and to date there have been no incidents of wildlife entering the camp. It is expected that the Red Deer camp would have similar arrangements.

Non-hazardous waste from the camps and project site will be disposed of in community and regional landfills in the vicinity of the pipeline. Additional waste disposed of during construction will not place a burden on existing landfills. As such, the camps are not expected to have any adverse environmental effects on local community services and infrastructure.

Human waste generated at the Project site during pipeline construction would be collected in onsite portable toilets for later removal and transportation to the nearest community sewage treatment facilities. The local company that rents and services these portable toilets would be responsible for collection and disposal of the human waste. The capacity of community sewage treatment facilities in the vicinity of the Project are adequate to dispose of sewage generated on the construction site.

Services in nearby communities will be accessed occasionally by construction workers accommodated in the camps in both British Columbia and Alberta (*e.g.*, laundry, groceries, *etc.*).

Based on the criteria identified in the key to Table 12-2, residual adverse environmental effects of project construction on community services and infrastructure are expected to be low in magnitude, geographic extent, and duration. The frequency of the occurrence of activities resulting in residual adverse environmental effects varies due to the intensity of activities during construction. However, when residual adverse environmental effects are predicted to occur, they are expected to be reversible. In addition, the various mitigation measures proposed in Table 12-2 will be effective in mitigating against residual adverse environmental effects.

Given the characteristics of the environmental effects on community services and infrastructure, the residual environmental effects of construction and commissioning are rated not significant.

12.1.4.2.2 Operation and Maintenance

The environmental effects on community services and infrastructure that may occur during the operation phase as a result of Project-related activities include changes in the quality or use of existing infrastructure (Table 12-3).

Operation and maintenance activities will involve workers using Provincial highways, municipal roads, and Forest Service Roads to access the pipeline ROW on a regular basis. Speed limits will be strictly observed by workers and enforced by Westcoast and provincial authorities. Overall, this activity will be infrequent and low in intensity and have little incremental influence on the transportation network. Routine inspection of the pipeline ROW will be conducted using a helicopter and thus will add no stress to existing local road infrastructure. Any environmental effects of maintenance activities will be localized, of low magnitude, and short duration.

Based on the criteria identified in the key to Table 12-3, the residual adverse environmental effect of maintenance activities are expected to be low in magnitude, geographic extent, duration, and frequency. However, when residual adverse environmental effects are predicted to occur, they are expected to be reversible. Given the characteristics of the environmental effects on community services and infrastructure, the residual environmental effects of operation and maintenance are rated not significant.

Table 12-3
Environmental Effects Assessment Matrix: Community Services and Infrastructure – Operation and Maintenance

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Maintenance	Change in the Quality or Use of Infrastructure (A)	Speed limits will be observed and enforced; road use will be planned to not interfere with other industrial users in the area	1	1	1/1	R	2
KEY Magnitude: 1 = community services and infrastructure are affected in nearby communities for less than one year 2 = community services and infrastructure are affected in nearby communities for more than one year, but less than the predicted life of the Project 3 = community services and infrastructure in nearby communities are affected for longer than the predicted life of the Project, or irreversibly		Geographic Extent: 1 = nearby communities 2 = regional (northeastern BC and/or northwestern Alberta) 3 = BC and/or Alberta Duration: 1 = < 1 month 2 = >1 month but <1 year 3 = >1 year	Frequency: 1 = < 10 events/year 2 = 11-50 events/year 3 = 50-100 events/year 4 = continuous Reversibility: R = Reversible I = Irreversible		Socio-Cultural/Ecological Context: 1 = Area has not been adversely affected by human activity 2 = Evidence of adverse environmental effects N/A = Not Applicable		

12.1.4.2.3 Decommissioning and Abandonment

Environmental effects on community services and infrastructure that may occur as a result of decommissioning and abandonment activities include changes in the quality or use of infrastructure and/or changes in the quality of community services (Table 12-4).

Table 12-4
Environmental Effects Assessment Matrix: Community Services and Infrastructure – Decommissioning and Abandonment

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Decommissioning and Abandonment	Change in the Quality or Use of Infrastructure (A)	Speed limits will be observed and enforced; use existing access roads; carpool or transport workers by bus	1	1	2/1	R	2
	Change in the Quality of Community Services (A)	Camps would be used to accommodate workers	1	1	2/1	R	2

KEY

Magnitude:
1 = community services and infrastructure are affected in nearby communities for less than one year
2 = community services and infrastructure are affected in nearby communities for more than one year, but less than the predicted life of the Project
3 = community services and infrastructure in nearby communities are affected for longer than the predicted life of the Project, or irreversibly

Geographic Extent:
1 = nearby communities
2 = regional (northeastern BC and/or northwestern Alberta)
3 = BC and/or Alberta

Duration:
1 = < 1 month
2 = >1 month but <1 year
3 = >1 year

Frequency:
1 = < 10 events/year
2 = 11-50 events/year
3 = 50-100 events/year
4 = continuous

Reversibility:
R = Reversible
I = Irreversible

Socio-Cultural/Ecological Context:
1 = Area has not been adversely affected by human activity.
2 = Evidence of adverse environmental effects

N/A = Not Applicable

Pipeline decommissioning involves activities similar to maintenance, but would occur over a short period of time. The pipeline will be cleaned, prepared for in-ground containment and capped. There would be little interaction between decommissioning activities and community services and infrastructure, and therefore, no substantive potential environmental effects.

Abandonment activities involve activities similar to construction, in that the pipeline, after it has been decommissioned, would likely be removed from the ground, or stabilized in place, particularly in environmentally sensitive areas such as stream crossings where it would be less disturbing to fish habitat the stream substrate to leave the pipeline in place, and the RoW would be reclaimed. Abandonment activities may result in the short-term use of community services and infrastructure in the area. Interaction would be minimal as crews would be housed in camps. The likelihood that the Project would be abandoned in the foreseeable future is low.

Speed limits on provincial roads and access roads will be strictly observed by workers involved in decommissioning and abandonment activities. Carpooling and transporting workers to the work sites will minimize the number of vehicles traveling on the access roads. Temporary access to and along the RoW for abandonment activities will be removed and reclaimed at the conclusion of activities.
Based on the criteria identified in the key to Table 12-4, the residual adverse environmental effect of decommissioning and abandonment activities are expected to be low in magnitude, geographic extent, duration, and frequency. However, when residual adverse environmental effects are predicted to occur, they are expected to be reversible. Given the characteristics of the environmental effects on community services and infrastructure, the residual environmental effects of decommissioning and abandonment are rated not significant.

12.1.4.2.4 Accidents, Malfunctions, and Unplanned Events

Environmental effects on community services and infrastructure that could occur as a result of malfunctions, accidents, and/or unplanned events include changes in the quality or use of infrastructure and change in the quality of community services (Table 12-5). Accidents, malfunctions and unplanned events that could occur associated with the Project include a pipeline leak or rupture, an accident involving a member of the public, vehicle collisions, a forest or brush fire, a spill or accidental release of a hazardous material, and unplanned access into the Project area.

Malfunctions, accidents, and unplanned events are difficult to predict, but when they occur, they will be short-term in duration and the associated environmental effects will likely be localized or of low relative intensity due to the effective implementation of various mitigation strategies. Westcoast has developed several mitigation strategies to address malfunctions, accidents, and unplanned events. A Fire Contingency Plan (FCP) and a Spill Contingency Plan (SCP) are included in the Project-specific Environmental Protection Plan (EPP, Section 16). In addition, Westcoast will prepare an ERP that identifies procedures to be implemented by Contractors and Westcoast personnel in the event of a malfunction, accident or unplanned event, and will file the plan with nearby fire, police, and other municipal emergency response services in both BC and Alberta. The likelihood of an extensive forest fire is low given the nature of the work, the existence of the ERP, and given that the Province has emergency forest fire response crews. In the case of an accident, malfunction, and/or unplanned event, the services of nearby fire, police, and emergency response crews may be necessary, depending on the event. Given the infrequent nature of an accident, malfunction, or unplanned event that would require municipal and provincial emergency response, the emergency services and infrastructure of nearby communities will not be unduly stressed. Westcoast commits to containing, controlling, and cleaning up any results from an accident, malfunction or unplanned event as part of their ERP and EPP.

Based on the criteria identified in the key to Table 12-5, the residual adverse environmental effects of a malfunction, accident, or unplanned event are expected to be low in magnitude, geographic extent, duration, and frequency. However, when residual adverse environmental effects are predicted to occur, they are expected to be reversible. Given the characteristics of the environmental effects on community services and infrastructure, the residual environmental effects of accidents, malfunctions, and unplanned events are rated not significant.

Table 12-5
Environmental Effects Assessment Matrix: Community and Infrastructure – Accidents, Malfunctions, and Unplanned Events

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Pipeline Rupture/Leak	Change in the Quality or Use of Infrastructure (A)	Emergency Response Plan (ERP)	1	1	1/1	R	2
	Change in Quality of Community Services (A)	ERP	1	1	1/1	R	2
Construction Worker Accidents	Change in the Quality or Use of Infrastructure (A)	ERP	1	1	1/1	R	2
	Change in Quality of Community Services (A)	ERP	1	1	1/1	R	2
Public Accidents	Change in the Quality or Use of Infrastructure (A)	ERP	1	1	1/1	R	2
	Change in Quality of Community Services (A)	ERP	1	1	1/1	R	2
Vehicle Collisions	Change in the Quality or Use of Infrastructure (A)	ERP	1	1	1/1	R	2
	Change in Quality of Community Services (A)	ERP	1	1	1/1	R	2
Forest/bush Fire	Change in the Quality or Use of Infrastructure (A)	ERP: Fire Contingency Plan (FCP) (EPP)	1	2	1/1	R	2
	Change in Quality of Community Services (A)	ERP: FCP (EPP)	1	2	1/1	R	2
Spill or Accidental Release of Hazardous Material	Change in the Quality or Use of Infrastructure (A)	ERP: Spill Contingency Plan (EPP)	1	1	1/1	R	2
	Change in Quality of Community Services (A)	ERP: Spill Contingency Plan (EPP)	1	1	1/1	R	2
Unplanned Public Access	Change in the Quality or Use of Infrastructure (A)	ERP: Access Management Plan	1	1	1/1	R	2

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
KEY Magnitude: 1 = community services and infrastructure are affected in nearby communities for less than one year 2 = community services and infrastructure are affected in nearby communities for more than one year, but less than the predicted life of the Project 3 = community services and infrastructure in nearby communities are affected for longer than the predicted life of the Project, or irreversibly		Geographic Extent: 1 = nearby communities 2 = regional (northeastern BC and/or northwestern Alberta) 3 = BC and/or Alberta Duration: 1 = < 1 month 2 = >1 month but <1 year 3 = >1 year	Frequency: 1 = < 10 events/year 2 = 11-50 events/year 3 = 50-100 events/year 4 = continuous Reversibility: R = Reversible I = Irreversible		Socio-Cultural/Ecological Context: 1 = Area has not been adversely affected by human activity. 2 = Evidence of adverse environmental effects N/A = Not Applicable		

12.1.4.3 Summary

Given the characteristics of potential Project-related environmental effects on community services and infrastructure, it is concluded that the environmental effects of the Project are rated not significant for each phase and for the Project overall (Table 12-6). This is because the predicted adverse residual environmental effects will result in a decline in the quality of community services and infrastructure that is of low magnitude, extent, duration and frequency throughout all phases of the Project.

Table 12-6

Summary of Project-related Environmental Effects: Community Services and Infrastructure

Phase	Residual Environmental Effects Rating
Construction and Commissioning	NS
Operation	NS
Decommissioning and Abandonment	NS
Accidents, Malfunctions and Unplanned Events	NS
Project Overall	NS

Key:
Residual environmental Effect Rating:
S = Significant Adverse Environmental Effect
NS = Not-significant Adverse Environmental Effect
P = Positive Environmental Effect

12.1.5 Cumulative Environmental Effects

At present and in the future community services and infrastructure have evolved to meet community needs. While it is acknowledged that the potential environmental effects of the Project (rated not significant) on Community Services and Infrastructure may overlap with those of other projects, the proposed mitigation is such that it is not anticipated that long-term unacceptable cumulative environmental effects could be reasonably expected to arise. In addition, the current well developed status of community services and infrastructure will support this Project and development in the near future. As a result, it is concluded that there is not CEA trigger.

12.1.6 Monitoring and Follow-Up

No monitoring and follow-up activities have been planned at this time.

12.2 Additional Submissions

There are no additional submissions related to Chapter 12.

12.3 Conclusions

Those matters considered pursuant to the CEAA have been addressed in Chapter 10.

Chapter 13

Labour and Economy

13.1 Westcoast Submission - Revised Draft CSR - 4 January 2002

13.1.1 Existing Conditions

13.1.1.1 Labour Force

During the period from 1991 to 1996, the experienced labour force in northeastern BC (primarily Fort St. John, Dawson Creek, Chetwynd, and Tumbler Ridge) increased 10%, from 23,035 to 25,255. The breakdown of experienced labour force by industry varied among communities and rural areas in the region. Primary industries (i.e., agriculture, mining, oil and gas, and forestry), construction, transportation and communications industries, and wholesale and retail trade industries employed the greatest number of people in northeastern BC (Westcoast 2001a).

From 1991 to 1996, the labour force increased in education, health and social services, finance, real estate, business services and accommodation, and food and beverages industries. During the same five-year period, government, construction and manufacturing sectors experienced a decline in the labour force.

The Engineering Procurement and Construction Management Contractor retained by Westcoast to design and oversee the construction of the Project estimated that all of pipeline construction jobs could be filled from within the northeastern region of British Columbia and the Grande Prairie area. This estimate was based on extensive past experience working with pipeline contractors located in the Grande Prairie and Fort St. John areas (Westcoast 2001a).

The major economic activities in northwestern Alberta, in the vicinity of the County of Grande Prairie, include agriculture, natural gas development, forestry, oil, manufacturing, and construction. In the City of Grande Prairie, wholesale and retail, government, health and social services, trades, and transportation industries employ the greatest number of people. Within rural areas, surrounding the City of Grande Prairie, primary industry-related activities employ the greatest number of people, followed by trades, and transportation, and wholesale and retail activities.

Although the labour force in the construction and manufacturing sector decreased in northeastern BC from 1991-1996, there will likely be an excess of skilled workers for new resource development Projects in the immediate future given the recent closing of the Quintette Coal Mine (August 2000) near Tumbler Ridge and the planned closure of the Bullmoose Coal Mine (2003). The availability of skilled labour resulting from the closure of the Quintette and Bullmoose Coal Mines may be relevant to the local pipeline operational jobs that will be created as a result of the Project (Westcoast 2001a).

There are seven First Nations communities, located in British Columbia and Alberta, in the vicinity of the Project, including West Moberly First Nation, the Saulteau First Nation, McLeod Lake Indian Band, Kelly Lake First Nation, Kelly Lake Cree Nation, the Horse Lake First Nation, and the Aseniwuche Winewak Nation. A description of each community was provided in Section 13.1.1.1. Westcoast has a database of qualified Aboriginal contractors and business in the area that can provide services related to pipeline construction.

13.1.1.2 Economy

The main economic drivers in northeastern BC and northwestern Alberta have been and will continue to be primary industries and associated manufacturing, regional administration and public services, and tourism. The industrial sectors provide the foundation for all other sectors in the region.

Although cyclical, oil prices are expected to continue to rise during the foreseeable future due to increasing demand for oil. Natural gas exploration and production in the LSA is expected to continue as a regulated and compatible land use in the vicinity of the Project, as the price of natural gas and access to North American markets increases and local infrastructure expands. The outlook for oil and natural gas exploration, production, and processing in northeastern BC and northwestern Alberta appears promising.

13.1.2 Boundaries

13.1.2.1 Spatial Boundaries

Spatial boundaries for the consideration of potential environmental effects, including cumulative environmental effects, on Labour and Economy encompass the northeastern region of British Columbia and the northwestern region of Alberta and includes the towns of Tumbler Ridge, Chetwynd, Dawson Creek, Fort St. John, the City of Grande Prairie, the County of Grande Prairie No. 1, the MD of Greenview, as well as the Aboriginal communities of West Moberly First Nations (BC), Saulteau First Nation (BC), Horse Lake First Nation (Alberta), Kelly Lake First Nation (BC), Kelly Lake Cree Nation, McLeod Lake Indian Band (BC), and the Aseniwuche Winewak Nation of Canada (Alberta), and surrounding rural communities and residents. Economic activities include oil and gas and minerals exploration and development, logging and other forestry activities, guiding and outfitting, trapping, other recreational land use, as well as, other land uses by Aboriginal persons.

13.1.2.2 Temporal Boundaries

Environmental effects of Project-related activities on Labour and Economy can occur during construction and commissioning, operation and maintenance, and decommissioning and abandonment. As well, environmental effects can occur as a result of malfunctions, accidents, and unplanned events.

Construction and commissioning of the proposed pipeline are expected to occur over two periods commencing in July 2002 (finishing by October) and late fall 2002 (finishing by spring break-up 2003). The operational life of the Project is anticipated to be 40 years and the presence of the cleared RoW is considered to be permanent throughout that time. Decommissioning and abandonment have been considered as a possible future event and duration of these activities will be similar to the construction phase. Malfunctions, accidents, and unplanned events can occur at any time during the construction, operation, and decommissioning and abandonment phases of the Project.

13.1.3 Residual Environmental Effects Rating Criteria

The definition for the significant residual environmental effects (including cumulative environmental effects) on labour and the economy is:

A *significant residual environmental effect* is one that results in adverse changes in regional employment and/or a decline in the regional economy of northeastern BC and/or northwestern Alberta, including Aboriginal communities. These environmental effects would be long-term, that is, they would persist for more than one year.

A *not significant residual environmental effect* is one that does not result in an adverse, long-term (i.e., longer than one year) change in regional employment and/or a decline in the regional economy of northeastern BC and/or northwestern Alberta, including Aboriginal communities.

A *positive residual environmental effect* is one that results in a benefit to the regional labour force and economy, as a result of increased employment and increased direct and indirect business revenue.

13.1.4 Evaluation of Project-related Environmental Effects

13.1.4.1 Potential Interactions

Potential interactions between Project-related activities and Labour and Economy are identified in Table13-1.

Table 13-1
Potential Interaction of Project Activities with Labour and the Economy

Project Activities and Physical Works	Potential Environmental Effects	
	Change in employment	Change in business revenue
Construction and Commissioning	✓	✓
Operation	✓	✓
Decommissioning and Abandonment	✓	✓
Accidents, Malfunctions and Unplanned Events	✓	✓

Potential environmental effects will potentially occur in all phases of Project development. Analysis and discussion of mitigation measures, where relevant, for all Project-related environmental effects are addressed in the following sections.

13.1.4.2 Environmental Effects Analysis

13.1.4.2.1 Construction and Commissioning

Environmental effects on Labour and Economy that may occur as a result of construction and commissioning activities include changes in employment and changes in business revenue (Table 13-2). It is anticipated that all environmental effects will be positive, resulting in decreased unemployment and increased direct and indirect business revenue in northeastern BC and northwestern Alberta. These will accrue to both Aboriginal and non-aboriginal people.

During stakeholder consultation, interest was voiced by many stakeholders, including Aborginal groups, regarding employment and business opportunities during the construction and commissioning, and operation phases.

It is estimated that the proposed pipeline will create 80 person-years of direct pipeline construction/installation employment, mainly in northeastern BC. It is assumed that the chosen contractor will build the facilities in two phases. Phase 1 (July - October, 2002) will be constructed in two spreads, one based in Tumbler Ridge, working on the section from KP 0 to KP 20, and one based at a field camp working on the section from KP 20 to KP 52 (Belcourt Creek). The labour force on each spread is expected to peak at 175, plus separate RoW clearing crews (~ 25 people/spread) working independently.

Phase 2 (late fall 2002 - spring break-up 2003) will also be constructed in two spreads, one based at the field camp and working on the section from Belcourt Creek to the Narraway River, and one based in Alberta, working on the section between the Narraway River and the eastern terminus of the pipeline. Again, the labour force on each spread is expected to peak at 175, plus clearing crews (~25 people/spread) working independently in either Alberta or British Columbia (J. Kenny, pers. comm.), permits and weather permitting

Pipeline contractors and most of the pipeline workforce skills are present in both northeastern BC and northwestern Alberta. It is anticipated that the pipeline contractor and 100% of the pipeline construction labour force could be hired, without creating labour shortages, from within the assessment area (Westcoast 2001a). Due to the fact that all of the work force can be recruited from within the assessment area, it is not anticipated that the population in northeastern British Columbia and northwestern Alberta will increase as a result of construction activity; however, unemployment in the area will likely decline.

In addition to the pipeline construction/installation contract, there would be several subcontracts and associated employment opportunities directly linked to the Project including:

- RoW clearing;
- Logging and decking;
- Processing and hauling timber;
- Road upgrading and maintenance;
- Construction camp rental and operation;
- Directional drilling;
- RoW clean-up; and
- RoW revegetation.

Table 13-2
Environmental Effects Assessment Matrix: Labour and Economy, Construction and Commissioning, Operation and Decommissioning and Abandonment

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Construction and Commissioning	Change in employment (P)	AES, BER, Training	1	2	2/1	R	2
	Change in business revenue (P)	BER	1	2	2/1	R	2
Operation and Maintenance	Change in employment (P)	AES, BER, Training	2	1	1/1	R	2
	Change in business revenue (P)	BER	2	1	1/1	R	2
Decommissioning and Abandonment	Change in employment (P)	N/A	1	1-2	1/1	R	2
	Change in business revenue (P)	N/A	1	1-2	1/1	R	2

KEY

Magnitude:
1 = labour force and the economy are affected in nearby communities for less than one year
2 = labour force and the economy are affected in nearby communities for more than one year, but less than the predicted life of the Project
3 = labour force and the economy in nearby communities are affected for longer than the predicted life of the Project, or irreversibly

Geographic Extent:
1 = nearby communities
2 = regional (northeastern BC and/or northwestern Alberta)
3 = BC and/or Alberta

Duration:
1 = < 1 month
2 = >1 month but <1 year
3 = >1 year

Frequency:
1 = < 10 events/year
2 = 11-50 events/year
3 = 50-100 events/year
4 = continuous

Reversibility:
R = Reversible
I = Irreversible

Socio-Cultural/Ecological Context:
1 = Area has not been adversely affected by human activity.
2 = Evidence of adverse environmental effects

N/A = Not Applicable
AES = Aboriginal Employment Strategy
BER = Business and Employment Registry

Westcoast has developed an Aboriginal Employment Initiative to meet the objectives of the company's Sharing a Vision Policy. The initiative articulates the company's commitment to providing opportunities for aboriginal participation in the Project, based on qualifications to perform the work and competitive pricing. It details a process for securing aboriginal content on the Project. Key elements of the strategy include:

- Setting aside certain Project elements for 100% aboriginal business participation including site security, clearing, logging and hauling, first-aid, and fencing;

- As part of the consultation process, Westcoast has compiled a list of qualified aboriginal businesses and individuals which will be provided to the prime contractor for inclusion in the tendering process;
- Westcoast has required an overall employment minimum of 5% for Aboriginal people, with a target of 10%, as articles in the contract with the prime contractor; and
- Job-related training in environmental monitoring and pipeline inspection will be offered in conjunction with programs of the Northeast Native Advancing Society, the University of Northern British Columbia, and the Southern Alberta Institute of Technology (SAIT).

Westcoast recognizes that effective management of communication with aboriginal businesses before and during Project construction is important to successful implementation of the Aboriginal Employment Strategy. Ongoing consultation with the communities, will be carried out by the Land and Community Coordinator working for Westcoast.

The capital cost of the Grizzly Extension Pipeline and the Weejay Lateral is estimated at $61.7 million (excluding GST). Approximately $31.7 million (51%) will be spent in BC. Most of the remaining $30.0 million would be spent in Alberta. In addition to capital costs, real direct income generated in the LSA from the Project is estimated at $3.5 million (excluding benefits), and indirect and induced income generated in British Columbia is estimated at $7.3 million (Westcoast 2001a).

Based on the criteria outlined in the key of Table 13-2 and based on the type of direct and indirect benefits predicted for nearby communities as a result of construction-related activities, the residual environmental effects on Labour and Economy are expected to be positive.

13.1.4.2.2 Operation and Maintenance

Environmental effects on Labour and Economy that may occur as a result of operations and maintenance include changes in employment and changes in business revenue (Table 13-2).

The pipeline will be operated and maintained from Westcoast's existing operating base at Chetwynd, B.C. The operating staff complement will be increased by two people. In addition up to 10 part time or contractor positions will be required for short-term maintenance work. Operations and maintenance expenses associated with the proposed pipeline are estimated to be $715,000 per year. Most of these expenses will be incurred in BC. Of this estimate, property taxes will account for $407,550 (57%) of the annual operations and maintenance budget, and wages, benefits, and other operating expenses will account for $307,450 (43%) of the budget.

Based on the criteria outlined in the key of Table 13-2 and based on the type of direct and indirect benefits predicted for nearby communities as a result of operation-related activities, the residual environmental effects on Labour and Economy are expected to be positive.

13.1.4.2.3 Decommissioning and Abandonment

Environmental effects on Labour and Economy that may occur as a result of decommissioning and abandonment include changes in employment and changes in business revenue (Table 13-2).

Pipeline decommissioning involves activities similar to maintenance, but would occur over a shorter period of time. The pipeline would be cleaned, prepared for in-ground containment and capped. There would be some employment required and increases in direct and indirect business revenues realized during this phase.

Should it be necessary to remove the pipeline, abandonment involves activities that would be similar to construction, in that the pipeline, after it has been decommissioned, would be removed from the ground or stabilized in place, particularly in environmentally sensitive areas such as stream crossings where it would be less disturbing to leave the pipeline in place, and the RoW would be reclaimed. Abandonment activities would result in short-term employment and increases in direct and indirect business revenues; however, no estimates have been calculated at this time.

Based on the criteria outlined in the key of Table 13-2 and based on the type of direct and indirect benefits predicted for nearby communities as a result of decommissioning and abandonment-related activities, the residual environmental effects on Labour and Economy are expected to be positive.

13.1.4.2.4 Malfunctions, Accidents, and Unplanned Events

Environmental effects on Labour and Economy as a result of malfunctions, accidents, and unplanned events include changes in employment and changes in business revenue (Table 13-3).

Table 13-3
Environmental Effects Assessment Matrix: Labour and Economy – Accidents, Malfunctions, and Unplanned Events

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Pipeline Rupture/Leak	Change in employment (P)	Training; ERP	1	2	1/1	R	2
	Change in business revenue (P)	Training; ERP	1	2	1/1	R	2
Construction Worker Accidents	Change in employment (A)	Worker health and safety program	1	1	1/1	R	2
	Change in business revenue (A)	Worker health and safety program	1	1	1/1	R	2
Vehicle Collisions	Change in employment (P)	Training	1	1	1/1	R	2
	Change in business revenue (P)	Training	1	1	1/1	R	2
Forest/bush fire	Change in employment (P)	Training, ERP, Fire Contingency Plan (EPP)	1	2	1/1	R	2
	Change in business revenue (P)	Training, ERP; Fire Contingency Plan (EPP)	1	2	1/1	R	2

Project Activity	Potential Positive (P) or Adverse (A) Environmental Effect	Mitigation	Evaluation Criteria for Assessing Environmental Effects				
			Magnitude	Geographic Extent	Duration/ Frequency	Reversibility	Socio-Cultural / Ecological Context
Spill or Accidental Release of Hazardous Material	Change in employment (P)	Training, ERP; Spill Contingency Plan (EPP)	1	2	1/1	R	2
	Change in business revenue (P)	Training, ERP; Spill Contingency Plan (EPP)	1	2	1/1	R	2
Loss of containment during water crossing(s)	Change in employment (P)	ERP; EPP	1	2	1/1	R	2
	Change in business revenue (P)	ERP; EPP	1	2	1/1	R	2
KEY Magnitude: 1 = labour force and the economy are affected in nearby communities for less than one year 2 = labour force and the economy are affected in nearby communities for more than one year, but less than the predicted life of the Project 3 = labour force and the economy in nearby communities are affected for longer than the predicted life of the Project, or irreversibly		Geographic Extent: 1 = nearby communities 2 = regional (northeastern BC and/or northwestern Alberta) 3 = BC and/or Alberta Duration: 1 = < 1 month 2 = >1 month but <1 year 3 = >1 year	Frequency: 1 = < 10 events/year 2 = 11-50 events/year 3 = 50-100 events/year 4 = continuous Reversibility: R = Reversible I = Irreversible		Socio-Cultural/Ecological Context: 1 = Area has not been adversely affected by human activity 2 = Evidence of adverse environmental effects N/A = Not Applicable ERP = Emergency Response Plan		

Although potentially harmful, malfunctions, accidents, and unplanned events not involving the loss of human life or worker injury would likely result in positive effects, due to the need for short-term employment to assist in clean-up or repair activities. Business revenues would increase for companies with specialized skills or equipment to assist in clean-up or repairs.

Worker accidents would likely result in adverse effects, not only for the worker, but also for the status of the Project. Work on the Project (particularly during construction) would likely be stopped temporarily if there was a worker accident, in order to clean-up or repair the damage, or to investigate the cause of the accident. Depending on the type of accident, the length of the delay could be hours or it could be days. However, the likelihood of a worker accident resulting in a substantial delay to the Project schedule is low, given that Westcoast has a number of mitigative measures in place to avoid workplace accidents (*e.g.*, mandatory safety training, Westcoast workplace health and safety program).

Based on the criteria outlined in the key to Table 13-3 and given the characteristics of environmental effects on Labour and Economy, the residual environmental effects of malfunctions, accidents, and unplanned events, in most cases, are rated positive. In the event of accidents involving workers, residual environmental effects, taking into account appropriate mitigation measures, are rated not significant as these result in adverse changes in employment and/or decline in the economy only of nearby communities. Such events are not likely to occur due to the implementation of mitigation measures such as mandatory worker health and safety training. No regional adverse change in employment and/or the economy that persists for a period of less than one year are anticipated.

13.1.4.3 Summary

Overall, given the characteristics of Project-Labour and Economy interactions, the residual environmental effects of all phases of the Project are rated positive for the Project overall and for most phases (Table13-4). In some rare cases, as stated in Section 13.1.4.2, the residual adverse environmental effects are rated not significant due to the potential for accidents, malfunctions, and unplanned events that might affect nearby communities.

Table 13-4

Summary of Project-related Environmental Effects: Labour and Economy

Phase	Residual Environmental Effects Rating
Construction and Commissioning	P
Operation	P
Decommissioning and Abandonment	P
Accidents, Malfunctions and Unplanned Events	P / NS
Project Overall	P / NS

Key:
Residual environmental Effect Rating:
S = Significant Adverse Environmental Effect
NS = Not-significant Adverse Environmental Effect
P = Positive Environmental Effect

13.1.5 Cumulative Environmental Effects

At present and in the future, Labour and Economy are acting as an integrated system. Although recent and impending closures in the coal mining industry at Tumbler Ridge have had some adverse cumulative environmental effects, these are balanced by other positive and ongoing developments in other sectors. Most of the anticipated environmental effects on Labour and Economy are predicted to be positive, with the exception of some potential malfunctions, accidents and unplanned events. As noted in Section 5.1.4.8, those environmental effects that might be considered to be potentially adverse are unlikely and with mitigation, could not reasonably be expected to contribute to unacceptable cumulative environmental effects. Therefore, it is concluded that there are no CEA triggers for Labour and Economy.

13.1.6 Monitoring and Follow-Up

Westcoast will monitor expenditures and employment for the construction period. Aboriginal employment and business will be tracked as part of the Business Employment Registry and to ensure successful implementation of the Aboriginal Employment Strategy.

13.2 Additional Submissions

There are no additional submissions related to Chapter 13.

13.3 Conclusions

Those matters considered pursuant to the CEAA have been addressed in Chapter 10.

Chapter 14

Changes to the Project Caused by the Environment

14.1 Westcoast Submission - Revised Draft CSR - 4 January 2002

The definition of environmental effect under *CEAA* includes any change to the Project that may be caused by the environment. Good engineering design involves consideration of these types of environmental effects and loadings or stresses on the Project. The planning and engineering design for this Project is no exception and this is central to addressing how these potential environmental effects will be mitigated.

14.1.1 Types of Environmental Effects

The types of environmental effects caused by the environment on the Project that could potentially occur include the following:

- Low temperatures, wind and ice;
- Extreme rain and snow;
- Hydrology
  - Floods,
  - Watercourse crossings, and
  - Wet terrain;
- Geohazards
- Landslides, and
- Earthquakes;
- Forest fires; and
- Corrosion.

14.1.2 Environmental Effects Analysis

There are a number of planning, design and construction strategies to minimize the potential environmental effects of the environment on the Project so that the risk of damage or interruption of service can be reduced to acceptable levels. Mitigation measures include, among other things, routing the pipeline to avoid potential problem locations, site specific backfill and cover requirements, installation of protective coatings, buoyancy control measures and corrosion prevention systems.

A *significant environmental effect of the environment on* the Project would be one that would result in a interruption in service or damage to infrastructure that would persist for greater than three months or that would result in repairs that could not be economically implemented.

A period of three months has been arbitrarily selected in the absence of broad experience in the analysis of the effects of the environment on the Project. Three months is viewed by Westcoast as a threshold of acceptability whereby Westcoast would incur "significant" financial loss from a catastrophic failure that resulted in loss of revenue and loss of customers due to the length of interruption.

14.1.2.1 Low Temperatures, Wind and Ice

Extreme low temperatures have the potential to reduce the ductility of the materials used to construct the pipeline and increase its susceptibility to brittle fracture. The materials specified for the Project have adequate toughness at the anticipated minimum ambient temperatures in the Project area to prevent adverse environmental effects. In addition, the buried sections of the pipeline are protected from temperature extremes by the overlying soil. Typically soil temperatures at the burial depth proposed would seldom drop below freezing.

Wind and ice have the potential to increase the structural loading of above ground facilities. The only structures that could be susceptible to damage by wind or ice are the communications towers on Compass Hill and at the LBC valve sites. All towers will be designed in accordance with the requirements of the latest revision of the CSA Standard on Antennas, Towers, and Antenna-Supporting Structures CAN/CSA-S37-94 to withstand the loading imposed by 1-in-50 year wind and ice events. The structures and foundations will be designed by qualified Professional Engineers giving consideration to the site specific soil conditions and potential weather-related environmental effects.

14.1.2.2 Extreme Rain and Snow

Extreme rain can result in work stoppages and difficult working conditions. Rain is an expected work condition and the schedule allows for rain. The sedimentation and erosion control measures in the EPP (Section 13) and Stream Crossing Report (EPP, Appendix 2) is aimed at controlling erosion and keeping sediment out of streams (*i.e.*, isolated crossings, HDD, aerial crossings). If unusual wet periods or excessive rain do occur, this can result in Project delays and the associated delay in completion and can result in additional capital cost. As half of the work is scheduled for the winter period or after freeze-up, the potential environmental effect of rain on that portion of the Project will be minimized. Other measures that would be used to mitigate potential effects of rain or runoff include maintaining surface and sub-surface drainage and installation of drainage and erosion controls.

Extreme snowfall has the potential to increase the structural loading on above-ground pipeline facilities, buildings and structures. Extreme snowfall can also affect winter construction or contribute to unusual flooding during snowmelt. Exceptional snowfall could delay construction and result in additional work for snow clearing and removal. This could increase construction costs. Early snow cover can minimize or prevent ground freezing and this may adversely affect winter construction access that is intended to improve work progress and minimizing vehicle soil-disturbance. Snowloads are small in comparison to the mechanical loads imposed on the pipeline and therefore will have no substantial environmental effect on it. The loading environmental effects of snowfalls have been considered in the development of the National Building Code and the design specifications for all the Project structures including the communications buildings and towers. Design of the facilities for anticipated site-specific snow loads will fully mitigate any environmental effects from snowfall. The mitigation measures identified in the preceding paragraph for rainfall-related environmental effects will also mitigate the potential environmental effects caused by runoff from snowfall.

14.1.2.3 Hydrology

14.1.2.3.1 Floods

The pipeline has been routed to avoid most areas subject to potential flooding. However, there is the potential for flooding of the right of way to occur at stream crossings. That could result in the potential to have structural integrity of the pipeline compromised by the forces generated by a flood. All major stream crossings will be designed by a Professional Engineer to ensure that the slopes are graded, the pipe located and anchored to prevent any adverse environmental effects. Use of swamp weights, concrete coating or mechanical anchors will prevent uplift of the pipeline. Along the RoW, drainage, erosion and sediment control measures will be placed to ensure that flash flooding does not result in a concentration of flow and consequent erosion or undermining of the pipeline or related structures.

14.1.2.3.2 Watercourse Crossings

The alteration of the course of streams and rivers, and the instability of banks have the potential to adversely affect the pipeline. The pipeline route has been selected to avoid areas where bank instability or scour or lateral erosion could occur. In addition, for drilled and buried crossings, the profile of crossing will ensure that sag bends are set back far enough to ensure pipe exposure resulting from lateral erosion does not occur. The pipeline will be installed at sufficient depth to ensure the pipe is not exposed in the event of down-cutting. The minimum depth of cover will be established to protect the pipe from scour arising from a 1 in 100-year river flow event. For aerial crossings, the support structure locations will be selected to avoid areas of instability or lateral erosion. In addition, the structure foundations will be armoured with rip rap as need in the event of flooding.

14.1.2.4 Wet Terrain

Wet terrain has the potential to prevent or delay construction activities, create buoyancy concerns and increase corrosion. Phase II construction in winter in particular is intended to minimize the potential for this terrain to prevent or delay construction or result in excessive costs. Buoyancy of the pipeline will be controlled by the installation of swamp weights, concrete coating or mechanical anchors. Corrosion of the pipeline will be controlled by installation of external pipe coating and a comprehensive cathodic protection system.

14.1.2.5 Geohazards

14.1.2.5.1 Landslides

The Project is located in an area where landslides do and can occur. Steep slopes and river banks are potentially problematic for this type of concern. There is potential for landslides in areas of steep slope and unconsolidated overburden. Also, as noted in Section 3.1.2, the bedrock geology includes soft bentonitic shales that have the potential to slide when bedding is at a sufficiently steep angle. The potential environmental effects of landslides has been mitigated by locating the pipeline route to avoid areas subject to these instabilities. In addition, during the construction phase, the Contractor will identify any areas of potential instability for further monitoring.

During the design phase, the design engineers have tried to avoid areas of potential ground instability. However, during the construction phase areas where instability may be encountered or created by the pipe installation process will be documented. The contractor will identify these areas to Westcoast during and after completion of the construction phase and Westcoast will develop recommendations for monitoring. These will be included in the Environmental As Built Report (Section 2.1.10.1.5)

The first year after completion of construction (following the first thaw) the RoW will be assessed for erosion concerns and any possible ground instability. A thorough review of the RoW will be done by the EHS Team Leader and the Facilities Management Team Leader for the Grizzly Valley Gathering Area to determine the success of reclamation and delineate areas of concern. Should areas of concern be identified Westcoast will develop a plan to address issues with the Contractor. This plan will include continued monitoring and/or remedial action, as necessary.

Should any instability persist during ongoing operations, the Facilities Management Team Leader would consult a geotechnical engineering specialist to recommend any monitoring or remedial action.

14.1.2.6 Earthquakes

The Project region has a low risk for seismic events. The National Building Code of Canada earthquake zone for the Project area is 1 for velocity and 0 for acceleration (maximum scale for both is 6). The pipeline and all related facilities will be designed to the applicable standards for earthquakes. The intention of these design standards is to ensure structural integrity based on the level of risk for earthquakes in the area. Although pipelines are less susceptible to earthquake damage than aboveground structures, should an earthquake damage the pipeline, there is potential for leaks or rupture. However, line-break control valves will isolate the failure and the release of gas would be minimized. Service would be interrupted until inspection and repair could be completed.

14.1.2.7 Forest Fires

There is potential for forest fires to interrupt construction or operation (Project-related fires are addressed as accidental events in relation to each VEC, as applicable, elsewhere in this report). Alberta and British Columbia have forest fire control programs in place to identify and control fires, minimizing the potential magnitude and extent of any forest fires, and their environmental effect on the Project. If a fire were to occur on or adjacent to the pipeline right of way during operation, the pipeline operating pressure may be reduced or the pipeline isolated and blown down. In the event of a severe fire the pipeline would not be placed back in service until the line could be inspected and any necessary remedial work completed.

14.1.2.8 Corrosion

The natural elements, particularly the interaction of soil, soil water (above the water table) and groundwater could result in pipeline corrosion. As a consequence, the pipeline will be designed to ensure that this corrosion potential is mitigated. Methods to be used to mitigate corrosion tendencies include installation of protective coatings and a cathodic protection system.

14.1.2.9 Significance

Based on a consideration of the various mitigative strategies applied in Section 14.1.2, it is concluded that the environmental effects, including cumulative environmental effects, of the environment on the Project are not significant.

14.2 Additional Submissions

14.2.1 Westcoast

Westcoast submitted geotechnical reports for water course crossings at Belcourt Creek, Narraway River and Gunderson Creek. Findings indicated that from a geotechnical perspective, horizontal directional drilling is feasible at all three crossings. However, Westcoast has since stated that an isolated crossing technique would be used at the Narraway River crossing.

Westcoast reiterated that the proposed pipeline avoided potential problem areas. In response to Wapiti's questions on why Westcoast's proposed right of way would not follow existing roads at a number of locations Westcoast stated that the proposed route would avoid these locations due to geotechnical considerations, such as slope instability and steep slopes, which could affect the constructability and long-term operation and maintenance of the pipeline.

14.3 Conclusions

Based on Westcoast's:

- routing selection in avoiding problem areas;
- undertaking of geotechnical studies at potential horizontal directional drill water course crossings;
- commitment to develop monitoring and remedial plans as required; and
- commitment to undertake mitigative measures and follow existing building codes,

the effects of the environment on the Project are adequately addressed. The changes to the Project that may be caused by the environment are not likely to be significant.

Chapter 15

Cumulative Environmental Effects Assessment Summary

15.1 Westcoast Submission - Revised Draft CSR - 4 January 2002

The intent of this Section is threefold:

- to provide an overview of cumulative environmental effects issues as discussed in each VEC section (Sections 6.0 to 13.0);
- to discuss the regional context in which the Project is placed and the regional trends contributing to substantive cumulative environmental effects; and
- to highlight the management strategies (Project-level and regional) Westcoast has developed and will implement to address the Project's contribution to cumulative environmental effects.

15.1.1 Overview of Cumulative Environmental Effects

The analysis provided for each VEC (Sections 6.0 to 13.0) indicates that there are no significant adverse cumulative environmental effects due to the contribution of the Project to the landscape-level or regional cumulative environmental effects. Project-related environmental effects considered in combination with those of other projects and activities do not cause any of the VECs to shift to an unacceptable state (defined by residual environmental effects rating criteria) (Hegmann *et al.* In Press). With respect to grizzly bear, there is evidence to suggest that there are exceedances of known core security habitat and road density thresholds, adopted from other study areas (see Section 9.1.5). However, it is concluded that the planned mitigation will assure that the Project will not contribute in a substantive way to these pre-existing cumulative environmental effects.

A key issue associated with the Project and other activities in the area is the environmental effect of project-induced access. Westcoast has focussed on implementing effective access management by developing a detailed Access Management Plan (EPP, Appendix 3). As a minimum the intention of the Plan is to prevent project-related contributions to induced access-related environmental effects. As an optimum objective, the Plan includes Westcoast's active involvement in regional access management initiatives that could slow and perhaps reverse the trend of cumulative environmental effects on grizzly bear and other affected VECs (*e.g.*, caribou, land use, traditional land use) in the region.

For each VEC, Table 15-1 summarizes the Project-related environmental effects and their contribution to cumulative environmental effects. In addition, the determination of significance of the contribution of potential Project-related environmental effects to cumulative environmental effects is also stated. The Project-specific mitigation strategies and regional-level management strategies to address the Project's contribution to cumulative environmental effects for each VEC is highlighted and described further in Section 15.1.3.

Table 15-1
Overview of the Project's Contribution to Cumulative Environmental Effects

CEA Trigger	Significance of the Contribution of Project-related Environmental Effects to Cumulative Environmental Effects	Mitigation Measures and Management Strategies for Cumulative Environmental Effects
Air Quality		
No CEA trigger (see Section 5.1.4.1) Project-related environmental effects will not contribute in a substantive way to adverse cumulative environmental effects in the RSA, with the implementation of planned mitigation (see Section 6.0)	The Project contribution to cumulative environmental effects on air quality is expected to be not significant with the implementation of planned mitigation measures. Potential significant environmental effects of a pipeline rupture are of very low likelihood.	N/A
Fish and Fish Habitat		
No CEA trigger (see Section 5.1.4.2) Project-related environmental effects will not contribute in a substantive way to adverse cumulative environmental effects in the LSA and RSA, with the implementation planned mitigation (see Section 7.0)	The Project's contribution to cumulative environmental effects on fish and fish habitat is expected to be not significant with the implementation of planned mitigation measures.	N/A
Vegetation		
No CEA trigger (see Section 5.1.4.3) Project-related environmental effects will not contribute in a substantive way to adverse cumulative environmental effects in the LSA and RSA, with the implementation of planned mitigation (see Section 8.0)	The Project's contribution to cumulative environmental effects on vegetation is expected to be not significant with the implementation of mitigation measures	N/A
Wildlife		
For grizzly bear, there is evidence that exceedences of known core security habitat and road density thresholds, adopted from other jurisdictions already exist in the RSA prior to the Project. Project-related environmental effects on wildlife, in combination with the environmental effects of other projects and activities, may contribute to existing cumulative environmental effects in the LSA and RSA as a result of habitat loss, sensory disturbance of reduced habitat effectiveness, and related human-caused mortality as a result of increased access (see Section 9.0)	The Project's contribution to cumulative environmental effects on wildlife VECs is expected to be not significant with the implementation of mitigation measures	Access controls (EPP, Section 10.0 and Appendix 3); Monitoring effectiveness of access controls and adaptive management measures based on the results of monitoring; and Long-term commitment to participation in regional coordinated access planning and management.

CEA Trigger	Significance of the Contribution of Project-related Environmental Effects to Cumulative Environmental Effects	Mitigation Measures and Management Strategies for Cumulative Environmental Effects
Land Use		
Project-related environmental effects, in combination with the effects of other projects and activities, may contribute to existing cumulative environmental effects in the RSA as a result of increased access (see Section 10.0)	The Project's contribution to cumulative environmental effects is expected to be not significant with the implementation of mitigation measures	Access Management (EPP, Section 10.0 and Appendix 3); Monitoring effectiveness of access controls and adaptive management measures based on the results of monitoring; and Long-term commitment to participation in regional coordinated access planning and management.
Aboriginal Land Use and Archaeological Resources		
Project-related environmental effects, in combination with the effects of other projects and activities, may contribute to existing cumulative environmental effects in the RSA as a result of increased access (see Section 11.0)	The Project's contribution to cumulative environmental effects is expected to be not significant with the implementation of mitigation measures	Access Management (EPP, Section 10.0 and Appendix 3); Monitoring effectiveness of access controls and adaptive management measures based on the results of monitoring; and Long-term commitment to participation in regional coordinated access planning and management.
Community Services and Infrastructure		
No CEA trigger (see Section 5.1.4.7) Project-related environmental effects will not contribute in a substantive way to existing cumulative environmental effects in the RSA, with the implementation of planned mitigation (see Section 12.0)	The Project's contribution to cumulative environmental effects is expected to be not significant with the implementation of planned mitigation	N/A
Labour and Economy		
No CEA trigger (see Section 5.1.4.8) Project-related environmental effects will not contribute in a substantive way to existing cumulative environmental effects in RSA, with the implementation of planned mitigation (see Section 13.0)	The Project's contribution to cumulative environmental effects is expected to be positive and this will be enhanced by the implementation of planned management strategies	N/A

15.1.2 Regional Trends

While it is valuable to identify direct Project activities and indirect Project-related environmental effects that may contribute to overall cumulative environmental trends, it is equally important to examine the regional context in which the Project exists. While the contribution of the Project to cumulative environmental effects has been determined to be not significant with planned mitigation (Section 15.1.1) it remains that the combination of various land uses in the past, present and future will act cumulatively on the VECs considered in this CSR.

Primary land uses in the northeastern region of British Columbia and the northwestern region of Alberta include oil and gas developments, mining, forestry, agriculture, trapping, hunting, guide outfitting, and recreation activities. These land uses are acting cumulatively in a complex manner. In many ways these land uses are compatible but in other ways they conflict.

Projects and activities within this broader region have been reviewed for the purpose analyzing the cumulative environmental effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out. Other projects that could potentially act in combination with the Project to cause cumulative environmental effects on an identified VEC include:

- Oil and gas exploration, well development and production, and associated infrastructure and activities;
- Forest resource harvesting and associated infrastructure and activities;
- Mineral prospecting and exploration and associated infrastructure and activities; and
- Guide/outfitter infrastructure.

Several other activities have also been considered as they occur regionally and may potentially contribute to cumulative environmental effects on certain VECs. These activities include: hunting; trapping; non-consumptive recreational use; and current use of the land by Aboriginal persons for traditional purposes.

Resource development activities such as oil and gas development, mining and forestry are typically characterized by exploration into relatively undisturbed areas with poor existing access. Resource extraction will entail access development (*e.g.*, resource roads, haul roads, trails, seismic lines, etc.) into these previously less accessible areas. The landscape surrounding Tumbler Ridge, Chetwynd, Dawson Creek, and Grande Prairie is influenced by a complex network of provincial and inter-provincial highways, municipal roads, resource roads, trails, and seismic exploration lines, all providing access to Crown and privately-owned land for multiple user groups.

British Columbia's northeastern region and Alberta's northwestern region have historically supported multiple industrial resources uses, principally oil and gas exploration and development, mining and timber harvesting. A review of recent and planned resource development projects indicates that growth in resource development activities in this region will continue (Section 5.1.2.2). This implies that access into previously undisturbed areas will likely increase with the pace of development, contributing to cumulative environmental effects on existing land uses, Aboriginal land use, and wildlife habitat.

Oil and Gas Development

The development of several gas fields in the region has resulted in exploration and development activities, including seismic, pipeline construction, and associated facilities, access roads, and well sites. The Project area is traversed by seismic cutlines, the highest density of which is found in the northern half of the Project area. Well development activities have been occurring since at least the mid 1950s with surges of activity in the mid-seventies and late nineties to present. There are approximately 35 flowing gas wells in the vicinity of the Project, mainly concentrated in the northern and southeast portions of the Project area. Additionally, there are approximately 120 abandoned or suspended well sites, with varying levels of associated access. Only a few wells, with minimal access, are found in the area between Huguenot Road and the Narraway River. Existing pipeline RoWs are concentrated in the vicinity of the northwest and southeast terminuses of the proposed Grizzly Extension Pipeline.

Westcoast operates an existing pipeline that runs parallel to the first 15 km of the proposed line in British Columbia, and two Westcoast lines tie into this line. Canadian Natural Resources Limited operates four short lines that tie in with the existing Westcoast system. In Alberta, at the southeast end of the proposed Grizzly extension pipeline, Canadian Forest Oil operates a line that roughly parallels the Two Lakes Road and later joins an Anderson Resources (now Devon Resources) pipeline that extends south and east beyond the terminus of the proposed Project. A short Canadian Hunter pipeline joins the Anderson line in that section.

The natural gas potential in the region is high and current development trends are likely to continue as existing projects become operational and new leases are developed. In British Columbia there is one active application for seismic exploration in the Wapiti Drainage, east of the proposed Project. In Alberta, heli-portable, three-dimensional seismic exploration work is currently underway north of the proposed pipeline route between the Two Lakes Road and the BC-Alberta border. Twenty-nine gas wells are currently planned in the pipeline catchment area: sixteen of these are located east of the Narraway River (of these, ten are east of the pipeline's eastern terminus); ten are located north of the route (West of the Narraway); and three are located south of the route. In the area between the Narraway River and the Huguenot Road there are currently no applications for well development. However, a number of companies have interest in the lands north and south of the route. There are no known applications for pipelines other than proposed Project; however, well developments may lead to pipeline applications. The numbers of additional pipelines that could be constructed cannot be predicted.

Mining

There are several important coal deposits in the vicinity of the proposed route. Coal mining has been a dominant resource development in the Tumbler Ridge area. Exploration was most active the 1970s and early 1980s and since that time many of the coal leases have lapsed and the industry has recently been in decline. For example, the Quintette Coal Mine closed in August 2000, and the Bullmoose Coal Mine is planned to shut down in 2003. However, future opportunities for mining exist. In the last two years several small companies have acquired some of the key former leases and have re-evaluated their potential. There are two tenured coal prospects located within 5 km to the west of the pipeline route: Monkman and Belcourt. No recent work has been conducted on the Monkman leases. Some test drilling was carried out within the past few years in the Belcourt prospect, however, there are currently no applications for development. There is considerable interest in coal bed methane (CBM) potential in this area. Several blocks of gas rights that have experimental status with the British Columbia Oil and Gas Commission parallel the pipeline route to the west. To date seven CBM well locations have been licensed and four of those drilled. These wells are being tested and technical assessments are underway. If economic reserves can be delineated then it would take several years to see staged development. There are no known areas of active aggregate mining in the vicinity of the Project although sand and gravel are mined elsewhere in the region for road construction, industrial developments and building structures. If oil and gas related activities continue to grow at the current pace, there will be an increased need for aggregate materials for construction purposes.

Forestry

Forestry harvesting occurs throughout the region on both sides of the BC-Alberta border. The proposed route traverses the Dawson Creek Forest District (of the Prince George Forest Region) on the BC side, and Forestry Management Unit G3(P) on the Alberta side, which is managed through the East Peace

Forest District Office. Timber licenses on the BC side are allocated to Chetwynd Forest Industries and the Ministry of Forests Small Business Enterprise Program (SBEP). Past activity by the SBEP has been concentrated between Red Deer and Belcourt Creeks. Chetwynd Forest Industries operates in the Flatbed Creek, Redwillow River, Wapiti and Red Deer Creek drainages in the vicinity of the Project. Within these areas, regeneration of cutblocks is at various stages of green-up. The timber operator on the Alberta side is Weyerhaeuser. Both the SBEP and Chetwynd Forest Industries have plans to continue harvesting in the region according to their five-year forest development plans. The SBEP has approved plans to harvest in several drainage areas in the vicinity of the Project, including: the Holtslander; Belcourt; Redwillow; and Kinuseo drainages. Chetwynd Forest Industries have numerous proposed and approved cutblocks located in various drainages in the vicinity of north half of the Project, to the east and west. Chetwynd Forest Industries in particular will require improvements and extensions to existing access roads to harvest in some of these areas (Section 5.1.2.2). Neither Chetwynd Forest Industries nor SBEP have any plans to harvest east of the Huguenot Road. In the current five year planning period, Weyerhaeuser harvesting activities are located along established access corridors in the Boundary Lakes area, and along the Two Lakes Road (Refer also to section 5.1.2.2). Long term access planning shows a proposed road corridor extending south from the Boundary Lakes access road and west of Sulphur Creek, intercepting the proposed pipeline route in the Goat Creek drainage. There are no plans to develop access or harvest in the Narraway drainage south of the Boundary Lakes area, within the next five to ten years (Luigi Morgantini, pers. comm.).

Other Activities

Trapping occurs throughout this region and is an important traditional use. Eleven registered traplines in BC and seven fur management areas in Alberta fall within the region. Hunting occurs year-round by local First Nation communities, and by other local residents and guide outfitters during hunting seasons. Caribou and grizzly are hunted in the region (including commercial guided hunting). Non-consumptive recreational activities occur year-round with the highest use occurring in the summer months. There are limited data to determine current levels of use for these activities and it is difficult to predict future trends. The commercial importance of trapping has diminished in recent years. An upswing in this use is highly dependent on the marketability of furs. The amount of hunting, outfitting and non-consumptive recreation is influenced by factors such as access, weather, economics and personal choices. Of these factors, access is most likely to be influenced by future development in the region.

Summary

Regional trends in land use support the view that various past and present land uses will continue into the future. Some of these will occur in areas that represent important wildlife habitat for grizzly bear and caribou particularly. Of particular concern are the cumulative environmental effects of increased access to areas important for wildlife and related consumptive and non-consumptive land uses. Project-related contributions to adverse cumulative environmental effects, as outlined in Section 15.1.1 and Table 15-1, will result in Project-related habitat loss and increased access, and the resulting potential for human-caused mortality. As discussed above, habitat loss, increased access and related human-cause mortality will continue with the pace of resource development and other consumptive and non-consumptive activities in the region. As a consequence, Westcoast has proposed a cumulative environmental effects mitigation strategy that ensures its own contribution to cumulative environmental effects is not significant. However, through adaptive management and initiatives to act as a catalyst for and demonstrate leadership in regional access management, Westcoast hopes to contribute to a reversal in regional cumulative environmental effects trends related to access. While this extends to issues and jurisdictions beyond its own responsibility and purview, Westcoast plans to be diligent in the pursuit of coordinated access management with other parties that are pursuing various land uses and the regulatory authorities that are responsible for the management of these. These strategies are reviewed in Section 15.1.3.

15.1.3 Management Strategies

Westcoast has devised Project-specific mitigation measures and a longer-term access management plan to address cumulative environmental effects at the local and regional level.

15.1.3.1 Project-specific Mitigation Measures

Project-specific mitigation measures are highlighted in Table 15-1 and include most of the measures outlined in the EPP, including:

- RoW preparation measures (*e.g.*, general measures, surveying and clearing, weed management measures) (Section 4.0);
- Grading and soil handling measures (Section 5.0);
- Cleanup and revegetation measures (Section 8.0);
- Access management controls (Section 10.0);
- Wildlife protection measures (Section 11.0);
- Fisheries protection measures (Section 12.0);
- Erosion protection measures (Section 13.0); and
- Historical resources protection measures (Section 14.0).

The environmental management and compliance measures (Section 2.1.10 and EPP Section 17.0) detail the procedures that will be undertaken to inspect work as it is being completed and post-construction; to monitor the implementation and effectiveness of the above environmental protection measures; and to report on inspection and monitoring results. Other specific mitigation and monitoring measures are discussed in Sections 6.0 through 13.0 and these are reflected as applicable in the EPP and other mitigation management tools.

15.1.3.2 Access Management Plan

In recognition of potential cumulative environmental effects resulting from access development, and as a result of a multi-stakeholder workshop hosted by Westcoast on March 1, 2001 in Dawson Creek, Westcoast developed a comprehensive Access Management Plan. This will guide Project development and Westcoast's long-term participation in a regional coordinated access management effort.

The Project-level objectives of the Access Management Plan are to:

- Deter public access on new corridor portions of Westcoast's pipeline RoW;
- Deter public access, while providing opportunities for access as required for Westcoast's operational duties (e.g., leak detection surveys and helicopter landing locations) and emergency response;
- RoW stability assessments;

- Reduce the potential for predator access and ease of travel on the pipeline RoW;
- Reduce the visual line-of-sight on the pipeline RoW for both predators and hunters; and
- Minimize the loss of high quality habitat for woodland caribou, grizzly bear, marten, and black-throated green warbler.

Specific access management measures to be implemented during construction, post-construction, and during and after decommissioning and abandonment are outlined in Section 3.1 of the Access Management Plan. Site-specific access management measures are also illustrated on the Environmental Alignment Sheets (Appendix C of the Westcoast Revised CSR, 4 January 2002 and EPP Appendix 5).

A program for monitoring the implemented access controls will be established by Westcoast during the construction phase. The post-construction monitoring program (AMP Section 5.0 and EPP Section 17.6) will focus mainly on access management, reclamation, revegetation (seeding, riparian planting, and reforestation), erosion control and slope stability. Monitoring is critical for determining the effectiveness of existing access control measures, making recommendations for improving them if necessary, and designing more effective measures in the future (*i.e.*, adaptive management). The monitoring program will involve visual inspections of the pipeline RoW for winter (*i.e.*, snow-mobile) and summer (*i.e.*, ATV) vehicular tracks. Inspections will occur during regular operation over-flights.

Westcoast will conduct a local-scale replacement vehicle use study to assess the effectiveness of access controls along strategic sections of the pipeline RoW. The study will focus on access for small motorized vehicles: ATVs; quads; snow-mobiles; and off-road motorcycles.

To assess current use of small motorized vehicles in the area, specialize off highway vehicle counting systems will be installed along the RoW at seismic cut line locations in the vicinity of the RoW to collect baseline motorized use information. Baseline data will be used to provide an indication of current use of seismic trails throughout the new pipeline RoW area.

Upon completion of construction, several additional counting systems will be installed at locations that have had no previous access. If the data analysis shows an increase in the number of small motorized vehicles on new RoW segments, then the access management approach for the Project will be reviewed and revised accordingly. Yearly reports will be produced, for a period of 2-3 years following construction, to summarize data collected to outline recommendations.

In addition to Project-specific access control measures, Westcoast will proactively consult with other known resource users and resource management agencies in the area independently and in the context of existing initiatives (*e.g.*, West Central Caribou Standing Committee in Alberta, Coordinated Access Management planning in BC) with the objective of coordinating access development and promoting consistent standards of access management by all users to achieve regional access management objectives (AMP Section 6). Westcoast intends to do this through diligent mitigation of its own contribution to cumulative environmental effects, leadership by example and pro-active dialogue with other land users and land managers.

15.1.4 Conclusion

The detailed evaluation of cumulative environmental effects in each VEC Section and in this summary of cumulative environmental effects addresses the following three key points in establishing the contribution of the Project to significant adverse cumulative environmental effects (Hegmann *et al.* in press):

- Does the Project have a measurable effect on a resource (*i.e.*, is there a Project-related environmental effect)?
- Does the Project's environmental effect act in a cumulative fashion with the environmental effects of other past, present, or future projects and activities (*i.e.*, is there a cumulative environmental effect)?
- Does the Project's environmental effect, in combination with those other projects and activities, shift the resource to an unacceptable state (*i.e.*, is there a significant cumulative environmental effect)?

As discussed in Sections 6.0 to 13.0 the Project will have an effect on the resources or VECs selected for assessment. Project-related environmental effects on some VECs (*i.e.*, wildlife, land use, traditional land use), are predicted to act in a cumulative fashion with the environmental effects of other projects or activities that have been or will be carried out. However, the Project's environmental effects in combination with those of other projects and activities do not result in any new exceedances of sustainability thresholds. Further, with the implementation of Project-specific mitigation measures, regional management strategies, and monitoring activities as described in Section 15.1.4, the Project's contribution to cumulative environmental effects is expected to be not significant.

15.2 Additional Submissions

15.2.1 Westcoast

Westcoast reviewed its core security habitat projections for grizzly bears and caribou in the RSA in conjunction with future gas pool development which could be tied into the Project. Westcoast identified the potential addition of six wells to the proposed Grizzly Extension and Weejay Lateral. The following is a summary of Westcoast's projections of grizzly bear and caribou core security habitat levels before the application of mitigation:

	Grizzly Bear	Caribou
Core Security Habitat in RSA before Project	37.3%	68.1%
Core Security Habitat in RSA after Project	37.0%	67.6%
Core Security Habitat in RSA after Project and 6 producer tie-ins	36.9%	67.5%

Westcoast asserted that the change highlighted above is negligible and would not alter the conclusion that the Project's contribution to regional cumulative effects was not significant.

Westcoast cited access management as an important element to help prevent the long-term proliferation of new access. New linear corridors reduce the amount of core security habitat that is available for wildlife species. Additional access increases risk to wildlife, either through legal or illegal hunting or other human-related conflicts, and results in a decline in the population of the species in question.

With respect to grizzly bears, Westcoast noted that there appears to be a level of core security habitat reduction in the RSA that is beyond what would be expected for a healthy, sustainable grizzly population. Westcoast focussed on access control measures to ensure that it was not creating an incremental adverse impact in the area. Westcoast utilized core security habitat modelling and asserted that its modelling assumptions were conservative, having considered 50 percent of all of the seismic lines to be high-use corridors when in fact they are not. Westcoast used this 50 percent level because it did not know the level of use on those seismic lines. Westcoast noted that when it ran its model with only the known high-use roads in the area (i.e. excluding features such as seismic lines), the core security habitat values increase to over 80 percent, which would meet the standards for sustaining grizzly bear populations in most jurisdictions. Westcoast took the view that the greatest concern for grizzly bear management in the area would be the cumulative loss of core security habitat, and the associated increase in mortality risk. Recognizing this issue, Westcoast committed to reducing the net contribution of the Project to core security habitat loss through the following measures:

- Aggressive access control measures on the right of way, as outlined in its access management plan; and
- Participation in off-site core security habitat recovery initiatives through the recovery or closure of existing linear disturbances.

In response to questions from Ms. Mason regarding the vulnerability of caribou in their core security habitat in winter, Westcoast noted that caribou on winter range tend to be vulnerable to repeated disturbances from human-related activities. As a result, Westcoast noted that there is emphasis put on protection plans for activities in caribou winter range, as detailed in its Caribou Protection Plan. Westcoast confirmed that it does not anticipate any caribou mortality as a result of construction or increased access.

Westcoast's stated goals for access management are to avoid interference with existing access patterns and to avoid the creation of new motorized access into previously unused areas. This goal of preventing public access on right of way that had not established any usage over the years, was restricted to the portion of the Project east of Huguenot Creek road (approximately KP 70.5) where the Project passes over the Narraway Valley because this area is least disturbed by existing access.

Westcoast indicated that it had reviewed its access control measures with local representatives of provincial wildlife agencies. Westcoast also committed to involving local people with local knowledge in the design and development of access control measures. Westcoast committed to provide education on the importance of access control in sustaining wildlife populations to its staff, contractors and residents in the area. Westcoast clarified that education for construction crews would be specific to requirements that would relate to the construction activities. Westcoast also indicated its intention to discuss with stakeholders, and with resource agencies the concept of closing existing access corridors off the right of way to try to recover core security habitat. Westcoast presented the view that better guidelines for access management across the region as a whole were needed. At the present time, a specific provincial forum for coordinating access management planning in B.C. side does not exist. Therefore, Westcoast has initiated a process that is specific to this area and to the Project.

With respect to the reasons for Westcoast's choice to deviate from existing road corridors at some locations, Westcoast testified that, for certain species of animals, the wider existing corridors get, the more of a physical barrier they become. Westcoast agreed that multi-use utility corridors are a good idea in certain areas, but stated that in other areas small route deviations could avoid the possibility that these corridors become a barrier to some species.

Westcoast agreed that the Wapiti area, where the pipeline diverged from existing access from KP 19 to KP 29 was designated as an access control point. In answer to questions from Wapiti, Westcoast indicated that the Wapiti River was a key area for access control and reviewed measures, including allowing the right of way to regrow to natural conditions in this area. Westcoast did not consider the area on either side of Belcourt Creek (approximately KP 49 to KP 52) to be a priority for access control due to its close proximity to roads and the fact that there are a number of recent cut blocks in close proximity to KP 50. The area which diverges from the existing roads between approximately KP 65 to KP 69 was an area with some access control measures identified, but was not considered a priority due to its proximity to an existing road corridor. Westcoast asserted that, where the proposed Project follows existing roads, it is already within the zone of influence on either side of those roads where there is reduced habitat availability or reduced habitat effectiveness. Therefore, Westcoast had primarily recommended rollback where the right of way deviates more than perhaps 300 to 400 metres from an existing road corridor. Westcoast acknowledged that, should the pipeline right of way become a new high-use corridor because of its proximity to roads, then the disturbance zone of the existing road would be expanded. Westcoast considered that a deviation of several hundred metres could potentially open up a substantive new zone of influence, but where the deviation was 50 to 60 metres from the road corridor, it felt that the new access potential was not significant enough to warrant access control.

Westcoast asserted that the Project contributions to existing cumulative effects would not be significant if the access control measures are completely effective, and agreed that the success of access management was contingent on effective monitoring and timely repair.

With respect to Westcoast's ability to effectively implement its access control structures, it noted that, while it did not yet have all of the permissions that are required from the provincial forestry departments for the development of the right of way and the access control measures, it was committed to implementing the measures proposed, or finding some alternate means of developing these measures. Westcoast indicated that access control measures would utilize large enough diameter material in an uncompacted fashion, to deter snowmobiles and all terrain vehicles.

Westcoast committed to inspecting access control measures from the air during regular routine pipeline monitoring and operations activities (quarterly) and, on the ground, as required based on aerial observations and monitoring data. Post construction monitoring of access would include the use of a specialized off-highway vehicle counting system at selected locations between the end of the Red Deer Forest Service Road East and the Narraway River. Observations of vehicles and tracks would be recorded as part of regular operations-related visual inspections of the pipeline. If access use is identified, measures for enhanced control would be implemented after consultation with provincial agencies, producers and forestry operators as appropriate.

With respect to Westcoast's ability to monitor and maintain their access control structures, Westcoast noted that people involved in that surveillance would be required to report any potential breaches of the access control measures and any signs of new access along the right of way. Westcoast noted that repair of access control structures might take as long as two weeks to carry out and that a maximum allowable time of one month was considered reasonable.

15.2.2 Intervenors

Wapiti submitted that the provincially regulated upstream exploration activities and the overall cumulative effects should be included in the decision making and the approval process for the Project. With respect to the section of right of way near KP 25, Wapiti questioned why the proposed route does not follow the road and questioned why Westcoast was opening up areas and infringing on habitat.

Ms. Biem questioned whether Westcoast's education program was sufficiently extensive. Ms. Biem expressed concern with Westcoast's ability to implement effective access control and challenged Westcoast's conclusions on the significance of the effect of the Project on the basis of the assumption that access control measures would be effective. Ms. Biem submitted that Westcoast had not examined the Project in terms of cumulative effects that would likely result from the oil and gas development that Westcoast acknowledged would follow and submitted that Westcoast's analysis of the environmental effects was "at most limited to the impacts of its current right of way proposal".

Ms. Biem provided detailed comments on the proposed conditions that were circulated for parties to consider (see Table 15-2).

Ms. Mason extended an offer to assist Westcoast with their post-construction quality control measures, including an offer to:

- photograph the right of way;
- inspect the areas for evidence of all terrain vehicles, snow machines or other human use; and
- work with the experts who may wish to conduct surveys and studies.

Table 15-2

Proposed Conditions[11]

Proposed Conditions	Comments from Parties
Westcoast shall apply access measures at all present and future clearings, right of ways and any other modifications to the landscape that could result in access to the Project right of way.	• Westcoast stated that it would be unwilling to accept this condition as it was inconsistent with its application, expert evidence and too open-ended. • Ms. Biem recommended strengthening wording to require Westcoast to prevent any unauthorized motorized access at all present and future clearings, right of ways and any other modifications to the landscape that could result in access to the project right of way.
Westcoast shall develop and file for Board approval, at least 30 days prior to commencement of construction or as otherwise directed by the Board, an access management program which shall include: (a) the goals for monitoring and managing access; (b) the measures and criteria to be used to achieve those goals;	• Westcoast stated that it would only be possible, or practical, for it to track ungulate and carnivore mortality associated its activities on the right of way. Westcoast noted it could also report on any mortality which comes to its attention. It was also noted that the category "carnivore" was too broad and that Westcoast could record ungulate and large carnivore mortality. • Ms. Biem recommended that: 1. the program be filed prior to completion of the CSR.; 2. accurate schematics of the proposed access prevention

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[11] It is customary during Board hearings to provide, for comment on by parties, proposed conditions for any certificate that might be issued.

Proposed Conditions	Comments from Parties
(c) the methods for tracking ungulate and carnivore mortality associated with activities on the right of way; (d) public education and awareness program on access control; (e) the criteria for determining the need for maintenance, repairs, or installation of new access control measures and the maximum time frame for conducting these activities; (f) provisions for consultation on access control with stakeholders; and (g) the reporting frequency.	measures be provided; 3. site specific plans for each access prevention measure, similar to stream crossing plans, be provided; 4. Westcoast provide a detailed explanation of how the proposed access prevention measures will prevent unauthorized access via snowmobiles in winter conditions; 5. Westcoast's consultation with stakeholders be limited to the selection of existing access routes intersecting with the Project that would be blocked as part of Westcoast's commitment to reduce off right of way access and with the basis that there be zero unauthorized motorized access to the Project right of way; 6. the program include a monitoring program incorporating multiple techniques, including electronic devices, First Nation, local personnel, and Westcoast's operational staff should be included in the program; 7. the program include evaluation and reporting on a quarterly basis, with annual summaries for at least three years and continuing afterward for any trouble spots and these reports be posted on the internet and be made available upon request; 8. the program should specifically address access prevention during construction; 9. the public education and awareness program on access prevention be augmented with an industry leadership program in which Westcoast would explain and promote its access control approach to other companies in the oil and gas sector, forestry, mining and off-road recreation sectors; and 10. Westcoast file, prior to the commencement of construction, copies of correspondence from provincial officials regarding the acceptability of timber salvage plans that incorporate timber required for access prevention measures.
Westcoast shall file with the Board, at least 14 days prior to the commencement of construction or as otherwise directed by the Board: (a) updated alignment sheets; (b) updated water course crossing drawings; and (c) any other updates to its environmental protection plan.	• Ms. Biem recommended that: 1. Westcoast file updated access control drawings; 2. a revised environmental education program for the construction phase with a strengthened program for supervised personnel, including contractors, subcontractors and employees thereof, be submitted; 3. Westcoast examine alternative routes and alignments with a view to relocating closer to existing roads; as an example, in the area covered by BP's proposed route; and 4. that the requirements in this condition be filed prior to completion of the CSR.
Unless the Board otherwise directs, Westcoast shall file with the Board, DFO and Environment Canada a post-construction environmental report within six months of the date that the Project is placed in service. The Post-construction environmental report shall describe the issues that have arisen up to the date on which the report is filed and shall: (a) provide a description of all amendments to practices, procedures and recommendations which have been implemented during the construction process;	• Ms. Biem recommended that: 1. regarding (e) and (f), that Westcoast provide as-built reports of access prevention features that would be suitable for later evaluation of the effectiveness of such features; 2. paragraphs (e) and (f) include a description of monitoring and reporting plans regarding access prevention measures; 3. the post-construction environmental report discuss the results of including industry education regarding access control in Westcoast's continuing industry contact programs.

Proposed Conditions	Comments from Parties
(b) state the issues that have been resolved, (c) state the issues that are unresolved and describe the measures which Westcoast proposes to take; (d) include copies of any as-built reports that are prepared in accordance with undertakings made to DFO, and any comments from DFO in respect of those reports; (e) provide a list and suitable map indicating all designated access routes, access control features and the location and type of all temporary facilities; (f) provide detailed alignments depicting the type and location of all as-built access control measures and any other features requiring monitoring; and (g) discuss the results of including public education on access control in Westcoast's continuing awareness program(s).	

The offer from Ms. Mason included an offer to keep records of birds, mammals, and any nesting or denning behaviour observed. Ms. Mason offered to collect any dead birds or mammals, and contact the appropriate authorities for analysis. Ms. Mason also suggested posting the results of this monitoring on Westcoast's website.

BP and Devon agreed that access management was appropriate in the Huguenot Creek area where Devon has been operating for some time under access management restrictions imposed by the Province of Alberta.

15.2.3 Department of Fisheries and Oceans Canada

Westcoast indicated in Table 15-1 that there is no CEA trigger for fish and fish habitat. DFO, in its 16 September 2002 letter[12], stated that this approach to CEA was inadequate. DFO observed that clearing and modification of riparian areas and the addition of more crossings will have residual impacts on fish habitat even with the application of appropriate mitigation. To address this discrepancy DFO has reviewed the information and mitigation measures discussed in Chapter 15 regarding the CEA of wildlife. Based on the information provided in this chapter regarding regional trends, linear disturbances and assuming that the proposed mitigation measures for wildlife in the area are implemented, DFO is able to conclude that cumulative effects impact to fisheries resources would be minor.

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[12] Comments provided pursuant to paragraph 16 of Amended Hearing Order and Directions on Procedure AO-02-GH-2-2002

15.3 Conclusions and Recommendations

Westcoast has adequately justified its proposed cumulative effects methodology (Hegmann *et al.*, 2000) and appropriately considered potential cumulative environmental effects.

A key component of the mitigation of the cumulative effects of the Project is Westcoast's Access Management Plan which details proposed measures for controlling access on the project right of way. In spite of these proposed measures, some parties raised concerns that the portions of the proposed right of way which deviated from existing roads would create new access. Concerns were also raised with the effectiveness of Westcoast's proposed measures.

Westcoast indicated that portions of the right of way which deviated from existing roads by 50 to several hundred metres (different distances were cited) did not constitute priority areas for implementing access control structures as these would be within the zone of influence of the existing road. Westcoast also indicated that the use of small deviations from existing transportation corridors could prevent those corridors from becoming so wide as to form a barrier to the movement of some species of wildlife. However, Westcoast acknowledged that parallelling a road corridor with another high use corridor could expand the zone of influence and reduce the level of core security habitat available. In such circumstances the benefits of deviating from existing use corridors may be negated by increased access. Therefore the effectiveness of the proposed access control measures and their timely repair or replacement are critical factors in preventing access to the proposed right of way and maintaining the current level of available core security habitat for access sensitive species.

The potential of the Project to create increased access would be mitigated with the implementation of the proposed access control measures. To ensure the effectiveness of these proposed access control measures it is recommended that:

Recommendation 6:

Westcoast shall develop and file for Board approval, at least 30 days prior to commencement of construction or as otherwise directed by the Board, an Access Management Program which shall include:

(a) the goals for monitoring and managing access;
(b) the measures and criteria to be used to achieve those goals;
(c) the methods for tracking ungulate and large carnivore mortality associated with Westcoast's activities on the right of way or which otherwise come to Westcoast's attention;
(d) public education and awareness program on access control;
(e) the criteria for determining the need for maintenance, repairs, or installation of new access control measures and the maximum time frame for conducting these activities;
(f) provisions for consultation on access control with stakeholders; and
(g) the reporting frequency.

Recommendation 7:

Westcoast shall file with the Board, at least 14 days prior to the commencement of construction or as otherwise directed by the Board:

(a) updated alignment sheets;
(b) updated water course crossing drawings;
(c) updated access control drawings; and
(d) any other updates to its environmental protection plan.

Recommendation 8:

Unless the Board otherwise directs, Westcoast shall file with the Board, DFO and Environment Canada a post-construction environmental report within six months of the date that the Project is placed in service. The Post-construction environmental report shall describe the issues that have arisen up to the date on which the report is filed and shall:

(a) provide a description of all amendments to practices, procedures and recommendations which have been implemented during the construction process;
(b) state the issues that have been resolved;
(c) state the issues that are unresolved and describe the measures which Westcoast proposes to take;
(d) include copies of any as-built reports that are prepared in accordance with undertakings made to DFO, and any comments from DFO in respect of those reports;
(e) provide a list and suitable map indicating all designated access routes, access control features and the location and type of all temporary facilities;
(f) provide detailed alignments depicting the type and location of all as-built access control measures and any other features requiring monitoring; and
(g) discuss the results of including public education on access control in Westcoast's continuing awareness program(s).

The access management program referred to in Recommendation 6 should specifically address the four primary sections of the proposed right of way which deviate from existing linear developments which are described as; Wapiti (KP 19 to KP 27.5); Belcourt Creek (KP 47.9 to KP 52.4); Unnamed Stretch (KP 65 to KP 69); East Section to Two Lakes Road (KP 70.5 to KP 95). The monitoring component of the program referred to in Recommendation 6 should be designed to identify areas along the right of way that require measures to sufficiently restrict access.

Ms. Biem recommended that certain of the proposed conditions be revised to provide for the filing of the information required by the conditions, prior to the completion of the CSR. The discussion in Chapter 8 with regard to a similar suggestion is applicable to these additional recommendations. Ms. Biem's suggestion that certain drawings be updated prior to construction has been incorporated into Recommendation 7. Ms. Biem's suggestion that all access control structures have site-specific detailed drawings, similar to stream-crossing drawings has not been adopted. Access control measures are not considered to be of the same level of complexity as stream crossings, and therefore do not require this level of detail.

Ms. Biem made a number of site specific and detailed proposals for Westcoast's Access Management program and Ms. Mason and family offered to assist Westcoast in monitoring the right of way. These suggestions may warrant further consideration by Westcoast based on more detailed field review and in consultation with potentially affected stakeholders. However, a determination of whether to include these proposals in a condition to a Board certificate is not required for the purpose of completing the CSR.

Westcoast's concerns that the proposed Condition 3 is extremely broad and open ended and Westcoast would not be able to comply with it, have been noted. The issue of appropriate access control is dealt with in Recommendation 7.

Based on an examination of the information provided, the proposed mitigative measures and the recommendations noted above, it is concluded that the Project is not likely to cause significant adverse cumulative environmental effects.

Chapter 16

Recommendations and Conclusions

Two of the factors requiring consideration pursuant to section 16 of the CEA Act are:

- the environmental effects of malfunctions or accidents; and
- the need for, and the requirements of, any follow-up program in respect of the project.

Westcoast addressed the above two factors separately for each VEC it identified. Abandonment and decommissioning of the Project were handled in the same manner.

The most serious environmental effect of malfunctions or accidents that may occur in connection with the Project is related to the release of sour gas. The potential release of sour gas and the conclusions with respect to the environmental effects of malfunctions or accidents are set out in Chapter 6.

A follow-up program would be required for the Project. The follow-up program would evaluate the need for and effectiveness of access control (Chapter 15) and to provide a mechanism to modify the approach if the original measures do not work as predicted.

In addition, the follow-up program would include the filing of further reports, such as the rare plant surveys (Chapter 8) and the Alberta archaeology and traditional land use reports (Chapter 11) to support the evidence provided on the presence of these resources and the mitigation proposed. The follow-up program would also involve reporting (Recommendation 8) on any issues that arise during construction and reclamation to verify the accuracy of the predictions made by Westcoast, the appropriateness and effectiveness of the mitigation that it has proposed, and the need for any further actions on the behalf of the responsible authorities. This reporting would be augmented with inspections by Board Staff during construction and over the life of the Project.

In considering the information provided on abandonment and decommissioning, it is concluded that the Project is not likely to cause significant adverse environmental effects with the implementation of Westcoast's mitigative measures. A future application and assessment for the abandonment of operation of the Project is required by the Act and CEAA.

Sustainable development, in the context of this Project, is inherent in the proposed mitigation measures and recommendations which are designed to minimize potential impacts of the Project on the environment. In assessing the Project and drafting recommendations, consideration was given to the capacity of renewable resources, affected by the Project, to meet the needs of the present and those of the future (Chapter 10).

Having considered all of the evidence and information within the scope of the assessment and the factors in section 16 of the CEAA, it is concluded that, with the implementation of the proposed mitigative measures, and the recommendations set forth in this CSR, the Project is not likely to cause significant adverse environmental effects.

The complete record of recommendations is listed below. The last three recommendations (Recommendation 9, 10, and 11) are unique to this chapter and generally mandate and verify adherence to the undertakings provided by Westcoast throughout the assessment process. These recommendations would take the form of conditions to any certificate that may be issued by the Board in respect of the Project.

Recommendation 1:

Westcoast shall, at least 30 days prior to placing the Project in service or as otherwise directed by the Board, file the emergency procedures manual required by section 32 of the Board's *Onshore Pipeline Regulations 1999*.

Recommendation 2:

Westcoast shall file the following information, at least 14 days prior to the commencement of construction of any water crossing to be constructed during the closure window for fisheries:

(a) a water quality monitoring program to be undertaken immediately prior, during and after construction;

(b) a contingency plan detailing the criteria for any measures that would be implemented as a result of monitoring undertaken pursuant to paragraph (a); and

(c) evidence as to whether the Department of Fisheries and Oceans Canada (DFO) is satisfied with any programs derived pursuant to paragraph (a) and with the measures described in (b).

Recommendation 3:

Westcoast shall file with the Board, at least 14 days prior to the commencement of construction or as otherwise directed by the Board, with respect to the traditional land use site found at UTM location 0663386E 6067418N (site #17 in Landsong, February 2002, Traditional Land Use Sites Assessment Basic Report):

(a) a description of the measures to be implemented for the mitigation of potential impacts to the site; and

(b) the results of the consultations with the Kelly Lake First Nations, Kelly Lake Cree Nation, West Moberly First Nations and McLeod Lake Indian Band.

Recommendation 4:

Westcoast shall file with the Board, at least 14 days prior to the commencement of construction, any revisions to the Traditional Land Use Sites Assessment and Archaeological Impact Assessment for the British Columbia portions of the Project.

Recommendation 5:

Westcoast shall file with the Board for approval, at least 60 days prior to the commencement of construction or as otherwise directed by the Board:

(a) a Traditional Land Use Sites Assessment report for the Alberta portion of the Project;

(b) a Heritage Resources Impact Assessment report for the Alberta portion of the Project;

(c) copies of correspondence from the British Columbia and Alberta provincial authorities responsible for Archaeological and Heritage Resources, regarding the acceptability of Westcoast's impact assessment reports and proposed mitigation measures.

Recommendation 6:

Westcoast shall develop and file for Board approval, at least 30 days prior to commencement of construction or as otherwise directed by the Board, an Access Management Program which shall include:

(a) the goals for monitoring and managing access;
(b) the measures and criteria to be used to achieve those goals;
(c) the methods for tracking ungulate and large carnivore mortality associated with Westcoast's activities on the right of way and any other mortalities on the right of way which otherwise come to Westcoast's attention;
(d) a public education and awareness program on access control;
(e) the criteria for determining the need for maintenance, repairs, or installation of new access control measures and the maximum time frame for conducting these activities;
(f) provisions for consultation on access control with stakeholders; and
(g) the reporting frequency.

Recommendation 7:

Westcoast shall file with the Board, at least 14 days prior to the commencement of construction or as otherwise directed by the Board:

(a) updated alignment sheets;
(b) updated water course crossing drawings;
(c) updated access control drawings; and
(d) any other updates to its environmental protection plan.

Recommendation 8:

Unless the Board otherwise directs, Westcoast shall file with the Board, DFO and Environment Canada a post-construction environmental report within six months of the date that the Project is placed in service. The Post-construction environmental report shall describe the issues that have arisen up to the date on which the report is filed and shall:

(a) provide a description of all amendments to practices, procedures and recommendations which have been implemented during the construction process;
(b) state the issues that have been resolved;
(c) state the issues that are unresolved and describe the measures which Westcoast proposes to take;
(d) include copies of any as-built reports that are prepared in accordance with undertakings made to DFO, and any comments from DFO in respect of those reports;
(e) provide a list and suitable map indicating all designated access routes, access control features and the location and type of all temporary facilities;
(f) provide detailed alignments depicting the type and location of all as-built access control measures and any other features requiring monitoring; and
(g) discuss the results of including public education on access control in Westcoast's continuing awareness program(s).

Recommendation 9:

Unless the Board otherwise directs, Westcoast shall cause the Project to be designed, manufactured, located and constructed and installed in accordance with those specifications, drawings, and other information or data set forth in its Application or as otherwise adduced in evidence before the Board in the GH-2-2002 proceeding.

Recommendation 10:

Unless the Board otherwise directs, Westcoast shall implement or cause to be implemented all of the policies, practices, and procedures for the protection of the environment included in or referred to in its Application or as otherwise adduced in evidence before the Board during the GH-2-2002 proceeding.

Recommendation 11:

Westcoast shall file with the Board, within 30 days of the date that the Project is placed in service, confirmation by an officer of the Company, that the Project was completed and constructed in compliance with the conditions set out in this Certificate and all policies, practices, and procedures included in or referred to in its Application or as otherwise adduced in evidence before the Board during the GH-2-2002. In the case of non-compliance with any of these provisions, Westcoast shall file with the Board a statement of the reasons for the non-compliance.

Chapter 17

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Appendix I

Scope of the Environmental Assessment

1. Introduction

Westcoast Energy Inc. (Westcoast) has applied to construct 114.8 km of natural gas pipeline in Alberta and British Columbia, pursuant to Section 52 of the *National Energy Board Act* (NEB Act). The proposed Grizzly Extension and Weejay Lateral pipelines will permit Westcoast to connect additional gas reserves in the Ojay/Weejay area of British Columbia and the Narraway areas of Alberta. The proposed Grizzly Extension Pipeline extends from the existing Grizzly Raw Gas Transmission system at a-74-G/93-I-15 in British Columbia to a proposed producer receipt point at LSD 5-3-63-11-W6M in Alberta. The westernmost tie-in of these facilities is located approximately 30 km east of Tumbler Ridge and 120 km southeast of the Pine River Plant. The Pine River Plant is located 30 km south of Chetwynd, B.C. These facilities will permit transportation of additional volumes of sour gas on the Grizzly RGT System for treatment at the Pine River Plant and the Kwoen facilities (sour gas processing facility, booster compressor unit and associated facilities) that are proposed by Westcoast in a separate application before the Board. The proposed Kwoen facilities are located approximately 29 km upstream (southeast) of the Pine River Plant.

2. Environmental Assessment Process

The application for the Grizzly Extension and Weejay Lateral pipelines pursuant to section 52 of the NEB Act requires that a comprehensive study of the proposed project be carried out pursuant to the *Canadian Environmental Assessment Act* (CEAA). The National Energy Board and the Department of Fisheries and Oceans are responsible authorities (RA) under the CEAA and have an obligation to determine the scope of the project and the scope of the assessment pursuant to section 15 of the CEAA.

3. Scope of the Project

Undertakings proposed by the proponent or likely to be carried out in relation to the physical works proposed by the proponent, including:

Construction, operation, decommissioning and abandonment of:

- 108.5 km of 406.4 mm (16") Outside Diameter (OD) natural gas pipeline (Grizzly Extension Pipeline) extending from the existing Grizzly Raw Gas Transmission system at a-74-G/93-I-15, approximately 30 km southeast of Tumbler Ridge in British Columbia, to a proposed producer receipt point at LSD 5-3-63-11-W6M, approximately 110 kilometres south west of Grande Prairie, Alberta, or about 85 kilometres south west of Beaverlodge, Alberta.;
- 6.3 km of 273.1 mm (10.75") OD pipeline which would extend from a receipt point at a producer well site at d-57-G/93-I-9 in British Columbia to a tie-in point on the proposed Grizzly Extension Pipeline at C-53-F/93-I-9 in British Columbia (Weejay Lateral Pipeline);
- associated block valve and line-break control assemblies;

- expansion of the communications network in the Grizzly Valley area through the construction of one new microwave radio site at Compass Hill;
- Ancillary undertakings in relation to the physical works identified above including
    - various temporary construction workspace;
    - use and maintenance of existing access roads; and
    - construction camps.

It should be noted that any additional modifications or decommissioning/abandonment activities would be subject to future examination under the NEB Act and consequently under the CEAA, as appropriate. Therefore, at this time, these activities will be examined in a broad context only.

4. Factors to be Considered

The assessment will include a consideration of the following factors listed in subsections 16(1)(a), (b), (c), and (d) of the CEAA:

(a) The environmental effects of the project, including the environmental effects of malfunctions or accidents that may occur in connection with the project and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
(b) The significance of the effects referred to in paragraph (a);
(c) Comments from the public that are received during the public review;
(d) Measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project;

In accordance with subsection 16(2) of the CEAA, the assessment will also include a consideration of the additional following matters:

(e) The purpose of the project;
(f) Alternative means of carrying out the project that are technically and economically feasible and the environmental effects of any such alternative means;
(g) The need for the project and alternatives to the project;
(h) The need for, and the requirements of, any follow-up program in respect of the project; and
(i) The capacity of renewable resources that are likely to be significantly affected by the project to meet the needs of the present and those of the future.

5. Scope of Factors

The review will consider the potential effects of the proposed project within spatial and temporal boundaries which encompass the periods and areas during and within which the project may potentially interact with, and have an effect on, components of the environment.

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